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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 21
NOVEMBER 1, 1973

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W73-13001 -- W73-13650

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 6, NUMBER 21
NOVEMBER 1, 1973

W73-13001 -- W73-13650

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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05 WATER QUALITY MANAGEMENT AND PROTECTION
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

SIMULATION OF COUPLED LEAKY AQUIFERS AND SURFACE-WATER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
Z. A. Saleem.
Available from the National Technical Information Service as PB-222 464, $3.75 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Las Cruces Technical Completion Report No 017, 1973. 70 p, 15 fig, 1 tab, 58 ref, append. OWRR A-028-NMEX (2). 14-31-0001-3231.

Descriptors: Hydrogeology, Water wells, Drawdown, Recharge, Transmissivity, *Groundwater movement, *Computer models, Hydraulic conductivity, Water table, *Aquifers, Artesian aquifers, *Hydrologic models, *New Mexico.
Identifiers: *Leaky aquifers, Surface-water system, *Multiaquifer systems, Discharge, Shallow aquifer, Two-aquifer system, Three-aquifer system, Nonlinear partial differential equations, Storativity, Semi-previous layer, Saturated thickness, Roswell-Artesian Basin, Pecos Basin, Aquitards.

A numerical model for simulation of groundwater flow in multiaquifer systems was developed. A system of nonlinear partial differential equations, isomorphic to groundwater flow in the multiaquifer, was formulated in a finite difference form suitable for the line successive overrelaxation technique. The resulting system of difference equations was solved using an efficient algorithm. The results derived from the numerical simulator for the flow to wells in two coupled aquifers were in good agreement with analytical results for the system. Analytical models of steady groundwater flow in a three-aquifer system which consists of a valley area containing a shallow aquifer and a deep aquifer coupled through an aquitard, and a highland area containing an intake-area aquifer, were derived. Four cases of the system were analyzed: in two of the cases, the vertical variations of the hydraulic head in the shallow unconfined aquifer were assumed small; and for the other two cases, an approximate differential equation to describe the flow in the unconfined aquifer was presented. The results indicated that a variation in the hydraulic characteristics of any one of the three aquifers affected the flow in all three aquifers and the leakage coefficient of the aquitard played a key role in governing the flow in the system. (Creel-New Mexico)
W73-13014

THE EFFECT OF URBANIZATION ON RUNOFF QUANTITY,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04C.
W73-13032

HYDROLOGIC RESPONSE OF MASSACHUSETTS WATERSHEDS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
J. M. Colonell, and G. R. Higgins.
Water Resources Bulletin, Vol 9, No 4, p 793-800, August 1973. 3 fig, 2 tab, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Massachusetts, *Statistics, Variability, Data collections, Hydrograph analysis, Hydrographs, *Watersheds (Basins).
Identifiers: *Hydrologic response function.

Hydrologic response, defined as the annual direct runoff divided by the annual precipitation, was computed for 21 watersheds in or near western Massachusetts, using a total of 232 years of hydrologic records. Variability of the results over the period of analysis was greater than is desirable to inspire confidence in the usefulness of the hydrologic response function; however, the results do suggest that the hydrologic response concept, with appropriate refinements, could be applied successfully to the problem of delineating hydrologic provinces and determination of drainage and storage in unregulated watersheds. (Knapp-USGS)
W73-13034

SOME PROBLEMS IN STOCHASTIC HYDROLOGY,
Texas Univ., Austin. Center for Research in Water Resources.
L. R. Beard.
Water Resources Bulletin, Vol 9, No 4, p 633-638, August 1973. 3 ref.

Descriptors: *Stochastic processes, *Synthetic hydrology, *Simulation analysis, *Statistical models, Statistical methods, Mathematical models, *Estimating, *Forecasting.
Identifiers: Stochastic hydrology.

In order to decrease the uncertainty that results in water resource planning and management studies due to the assumed recurrence of historical hydrological sequences, considerable study of stochastic processes in hydrology has taken place during the past 10-15 years. The general objective has been to develop a capability for generating a number of valid sequences, each of which could as reasonably occur as could a recurrence of past events. A number of serious problems have been encountered, the consequence of which has been a serious lag in the application of stochastic processes to real planning and management problems. These problems include an inability to generate droughts in some cases that are as extreme as have occurred historically, the generation of inconsistent values of streamflow at locations on the same stream, the lack of mathematical techniques for the management of incomplete data sets, a great increase in the computation required for planning and management studies, and theoretical and computational difficulties in expanding the scope of stochastic hydrology from monthly quantities to short-period quantities. (Knapp-USGS)
W73-13039

WATER AND LAND RESOURCES IN EDEN VALLEY, WYOMING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-13044

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07A.
W73-13075

COMPUTER PROGRAMS IN HYDROLOGY,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 07C.
W73-13076

'EXTENDED-RANGE' METEOROLOGICAL FORECASTS APPLIED TO MULTI-RESERVOIR MANAGEMENT DECISIONS,
Department of the Air Force, Scott AFB, Ill.
G. E. O'Connor, and R. A. Clark.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 542-554, (1972) 7 fig, 16 ref. OWRR A-019-TEX (3).

Descriptors: *Meteorological data, *Forecasting, *Reservoirs, *Management, *Decision making, *Hydrology, *Monte Carlo methods, Simulation analysis, Monthly, Temperature, Precipitation, Constraints, Surface runoff, Crops, Consumptive use, Evaporation, Mathematical models, Systems analysis.
Identifiers: *Multi-reservoir systems, Accuracy.

The uncertainty of future hydrometeorological conditions occurring within a river basin upsets the decision-making process when applied to water resources management. Presented is a model, developed in an attempt to enhance the operation of a multi-reservoir system; it utilizes 30-day meteorological forecasts of temperature and precipitation issued every 15 days by the National Weather Service, and is called MOHRS--Monthly Operational Hydrometeorological Simulator. The first application of the forecast assumes that the 30-day meteorological forecasts are 'perfect.' Forecast categories of precipitation and temperature provide physical constraints upon quantitative values synthesized by Monte Carlo simulation techniques. An objective analysis scheme reproduces observed spatial patterns well and facilitates computations of surface runoff, reservoir evaporation, and crop consumptive-use. A second application uses information on the accuracy of the forecasts versus observed weather for the 24 forecast periods per year. Results show that the forecasts provided hydrometeorological information which verified better than chance. Conditional probabilities were used to obtain an 'expected value' forecast of temperature and precipitation for each station. In general, this means of establishing knowledge of future conditions of evaporation and consumptive-use has worked well. (See also W73-13134) (Bell-Cornell)
W73-13139

BAYESIAN HYDROLOGIC MODEL BUILDING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
I. Rodriguez-Iturbe, J. Valdes, R. Lenton, and D. Valencia.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 631-645, (1972). 2 fig, 8 ref.

Descriptors: *Parametric hydrology, *Estimating, *Mathematical models, *Stochastic processes, *Methodology, Streamflow, Synthesis, Decision making, Probability, Planning, Nature, Systems analysis, *Risks.
Identifiers: *Bayesian techniques, *Model building, Errors, Loss function, Autoregressive models.

In order to build water resource management and operation models, a clear understanding must be gained of the stochastic nature of hydrologic processes and the interaction between those processes and the various control alternatives. Future systems will most likely require oberating policies to be devised and these policies will require hydrologic forecasts to be made on the values of both the mean and the extreme values of the variable at hand. The problems of estimating hydrologic parameters as a problem of decision analysis is discussed. The main uncertainties involved in hydrologic model building are examined from a Bayesian point of view. Special attention is given to the selection of the model itself and the estimation of its parameters. A first-order autoregressive model is examined in detail because of its frequent use in hydrologic simulation. It is believed that

Bayesian methods allow the engineer to include economic considerations by formally providing a loss function which specifies the seriousness of the errors in selecting acts, and by assigning prior probabilities to states of nature either on an objective or subjective basis. Furthermore, Bayesian techniques allow engineers to incorporate judgment and experience plus other types of regional information which should not be neglected in parametric hydrology estimation. (See also W73-13134) (Bell-Cornell)
W73-13144

INFORMATION CONTENT OF THE REGIONAL MEAN,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
J. D. Salas-La Cruz, and P. Guerrero.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 646-660, (1972). 6 fig, 3 tab, 7 ref.

Descriptors: Water resources development, *Available water, *Estimating, Measurement, Hydrology, Mathematical models, Gaging stations, Regions, Statistical models.
Identifiers: *Sensitivity analysis.

Water resources development requires among other things the knowledge of the water available in the area of interest. This is usually determined by hydrological measurements at various sites which give an estimate of the water available in the area. This estimate is generally expressed in the form of statistical characteristics such as the mean and the variance. The relative information content, of the mean of a hydrological variable, representative of a given region, is defined. A general formula for the information content I is given. Sensitivity analysis is shown to be sensitive to the parameters of the model describing the series. (See also W73-13134) (Bell-Cornell)
W73-13145

WATER RESOURCES OF BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. B. Sherwood, H. J. McCoy, and C. F. Galliher.
Geological Survey Open-file report (73007), 1973. 197 p, 64 fig, 7 tab, 32 ref.

Descriptors: *Water resources development, *Groundwater resources, *Surface waters, *Water quality, *Florida, Hydrologic data, Basic data collections, Aquifer characteristics, Water wells, Water yield, Transmissivity, Well data, Water pollution sources, Urbanization, Saline water intrusion, Water supply, Water utilization.
Identifiers: *Broward County (Fla).

Broward County, Florida, has large potential supplies of freshwater because of its approximately 60-inch annual rainfall and its massive manmade surface-water management system integrated with the highly permeable Biscayne aquifer. However, the rapid urbanization of the area has been accompanied by major natural and manmade water problems. Natural problems of flood and drought are caused by extreme variations in rainfall that range from as much as 20 inches per day during the rainy season to little or none for extended periods in the dry season. Manmade water problems include: seawater intrusion that resulted from overdrainage of the area; obtaining adequate water supplies for the mushrooming population; and pollution caused by the disposal of increasing quantities of wastes. The unconfined Biscayne aquifer is the source of all fresh groundwater in Broward County. Wells that tap the thick limestone in the deep part (100 or more feet) of the aquifer near the coast yield more than 1,000 gpm. The transmissivity of the aquifer ranges from 0.4 mgd per foot in the northern part of the county to 2.5 mgd per foot near the southern part. The quality of the groundwater is generally within the standards for potable water. (Woodard-USGS)
W73-13209

APPLICATION OF A SIMPLE HYDROLOGIC MODEL FOR RAINFALL-RUNOFF RELATIONS OF THE DALTON WATERSHED,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
M. H. Diskin, N. Buras, and S. Zamir.
Water Resources Research, Vol 9, No 4, p 927-936, August 1973. 7 fig, 3 tab, 5 ref.

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Simulation analysis, Model studies, Reservoirs, Runoff forecasting.
Identifiers: *Israel (Dalton Plateau).

The problem of determining the best operating policy for a small storage reservoir or pond was solved by means of a simulation model based on a simple conceptual hydrologic model developed for rainfall-runoff relations for the watershed contributing to the pond. The hydrologic model is represented by a single element described by one parameter and having only one state variable. The simple model was found to give an adequate representation of the watershed for the particular problem for which it was used. (Knapp-USGS)
W73-13362

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX C--CLIMATOLOGY AND METEOROLOGY.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 06B.
W73-13483

A SURVEY OF THE WATER RESOURCES OF ST. THOMAS, VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
D. G. Jordan, and O. J. Cosner.
Geological Survey Caribbean District open-file report, 1973. 55 p, 35 fig, 9 tab, 16 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Potential water supply, *Virgin Islands, Water quality, Hydrologic data, Streamflow, Runoff, Water yield, Aquifer characteristics, Water wells, Water supply, Water resources development, Water utilization, Geology, Climates, Topography, Rainfall, Groundwater recharge.
Identifiers: *St. Thomas (V I).

St. Thomas, with an area of 32 square miles, is the second largest of the Virgin Islands of the United States. The island is mountainous, and slopes commonly exceed 35 degrees along a central ridge 800 to 1,200 feet high running the length of the island. Water in Charlotte Amalie, the capital, is supplied by seawater desalting and water barged from Puerto Rico and is augmented by hillside rain catchments and individual roof catchments. Rainwater augmented by water hauling and a few wells is the source of water for the rural areas. Streamflow is meager--2% to 8% of the annual rainfall--and is predominantly storm runoff. Test drilling has shown that water can be obtained from fractured volcanic rocks in nearly all parts of the island. Fully developed, the surface water and groundwater resources of the island could yield 1.3 million gallons of water per day. Groundwater is slightly saline, commonly containing more than 1,000 milligrams per liter dissolved solids. Surface water is similar in mineral content to groundwater during base flow. (Woodard-USGS)
W73-13516

2B. Precipitation

EVALUATION OF TECHNIQUES FOR DETERMINING AVERAGE PRECIPITATION SEMIARID VALLEYS OF IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
D. L. Curtis.
M Sc Thesis, March 1973. 104 p, 12 fig, 15 tab, append. OWRR-A-034-IDA (1)

Descriptors: *Precipitation (Atmospheric), *Precipitation gages, *Rainfall disposition, *Isohyets, *Idaho, Watersheds (Basins), Data collections, Methodology, Mathematical studies, Equations, Regression analysis, Forecasting, Mapping.
Identifiers: *Reynolds Creek watershed (Idaho), Precipitation distribution.

The Raft River basin in south-central Idaho and the Reynolds Creek Experimental Watershed in southwest Idaho were studied to determine precipitation distribution in an attempt to develop better isohyetal maps for semiarid mountain valleys. Due to gage malfunctions in the Raft River network, only the data collected by the Agricultural Research Service on Reynolds Creek was analyzed. Two methods were used to determine precipitation distribution. The computer isohyetal method worked well on Reynolds Creek but should be used only where a dense gage network is available. The Thiessen method was preferred for areas where gages are spread out. The Thiessen method was also used to determine the relative accuracy of the mean precipitation estimate using less than 45 gages. A multiple-regression equation was developed for selecting the point precipitation measurements to be used in estimates of average precipitation on the Reynolds Creek Experimental Watershed. Results indicated that no fewer than 20 gages should be used to obtain a good estimate of average precipitation. (Woodard-USGS)
W73-13028

THE EFFECTS OF SEVERAL WEATHER DISTURBANCES ON THE SEICHES IN LAKE TRAVIS, TEXAS,
Texas Univ., Austin. Applied Research Labs.
For primary bibliographic entry see Field 02H.
W73-13060

CLIMATIC UNCERTAINTY EFFECTS ON MANAGEMENT AND DESIGN OF RESERVOIR-IRRIGATION SYSTEMS,
Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-13137

'EXTENDED-RANGE' METEOROLOGICAL FORECASTS APPLIED TO MULTI-RESERVOIR MANAGEMENT DECISIONS,
Department of the Air Force, Scott AFB, Ill.
For primary bibliographic entry see Field 02A.
W73-13139

UNCERTAINTY IN THE RETURN PERIOD OF MAXIMUM EVENTS: A BAYESIAN APPROACH,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. Davis, L. Duckstein, C. Kisiel, and M. Fogel.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 853-862, (1972). 2 fig, 1 tab, 16 ref.

Descriptors: *Hydrologic data, *Rainfall, *Simulation analysis, Precipitation, Summer, Poisson ratio, Computer programs, Probability, Mathematical models, Systems analysis, Methodology, Analytical techniques, *Risks.

Identifiers: *Bayesian methods.

In previous work by the co-authors, it was found that the return period of maximum point rainfall could be derived from the following event-based process valid for the summer precipitation season: (a) The number of events per season is Poisson distributed; (b) the amount of point rainfall per event may be exponentially distributed; and (c) the above two random variables are independent. The objective of this paper is (1) to obtain a correct distribution function of the return period when uncertainty arises in the parameters of the Poisson and exponential distributions and (2) to obtain the probability density function of the event corresponding to a given return period and that of the return period corresponding to a given event stemming from the same uncertainty. The methodology employs conjugate distribution for the Poisson and exponential distributions to permit direct computation of posterior distributions of rainfall amounts given point rainfall data. Computer simulation shows that errors in estimated return periods lead to underdesign even with 20 years of data (for the example used in this analysis). Extensions of the methods are possible to encompass effects of uncertainties in rainfall data samples on runoff estimates and associated economic factors. (See also W73-13134) (Bell-Cornell)
W73-13158

METEOROLOGICAL CONDITIONS IN THE ABRAMOV GLACIER BASIN (METEOROLOGICHESKIYE USLOVIYA BASSEYNA LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W73-13351

DEW: AN ADDITION TO THE HYDROLOGIC BALANCE OF DOUGLAS FIR,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 02I.
W73-13366

CLOUDINESS AS A GLOBAL CLIMATIC FEEDBACK MECHANISM: THE EFFECTS ON THE RADIATION BALANCE AND SURFACE TEMPERATURE OF VARIATIONS IN CLOUDINESS,
National Center for Atmospheric Research, Boulder, Colo.
S. H. Schneider.
Journal of the Atmospheric Sciences, Vol 29, No 8, p. 1413-1422, November 1972. 4 fig, 3 tab, 23 ref.

Descriptors: *Temperature, *Cloud cover, *Energy, *Solar radiation, Atmospheric physics, Cloud physics, Air temperature, Radiation, Clouds, Weather, Environmental effects, Infrared radiation, Model studies, Mathematical models, Climatology.

The effect of changes in cloudiness on the radiation balance was analyzed, using a simple atmospheric model in which cloud tops are regarded as a reflecting layer for solar radiation and as a blackbody radiator for the infrared atmospheric radiation. Calculations include the effect of variations in cloud top height. Local departures from the global-average results have been computed as a function of latitude. Global radiation balance calculations show that an increase in the amount of low and middle level cloud cover decreases the surface temperature. This result for the global-average case does not hold near polar regions, where the albedo of the cloudy areas can be comparable to (or even smaller than) the albedo of the snow-covered cloudless areas, and where, especially in the winter season, the amount of incoming solar radiation at high latitudes is much less than the global-average value of insolation. The exact latitude at which surface cooling changes to surface warming from a given increase in cloud cover depends critically on local values of the cloud albedo of the cloudless areas that are used in calculation. An increase in effective cloud top height increases surface temperature at all latitudes. (Jerome-Vanderbilt)
W73-13441

RADIOACTIVE FALLOUT IN RAIN AT MELBOURNE, 1958 THROUGH 1970,
Commonwealth Scientific and Industrial Research Organization, Appendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 05B.
W73-13585

2C. Snow, Ice, and Frost

A REACTIVE SILICATE BUDGET FOR THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W73-13061

ECOLOGICAL EFFECTS OF SNOWMOBILES,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 04C.
W73-13113

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (VI): APPENDICULARIANS OF THE CENTRAL ARCTIC, MYSIDS OF THE ARCTIC OCEAN AND CONFLUENT SEAS, FIELD GUIDE TO ARCTIC ZOOPLANKTONIC CRUSTACEANS OSTRACODS OF THE CENTRAL ARCTIC,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W73-13300

GLACIOLOGY OF SOVIET CENTRAL ASIA (GLYATSIOLOGIYA SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), Leningrad, 1972. 155 p.

Descriptors: *Glaciology, *Glaciers, Mountains, Snowpacks, Ice, Firn, Ablation, Glacial drift, Glacial sediments, Sediment yield, Suspended load, Discharge (Water), Heat balance, Meteorological data, Palynology, Radar, Aerial photography, Satellites (Artificial), Snow surveys, International Hydrological Decade.
Identifiers: USSR, *Soviet Central Asia, *Abramov Glacier, Glacier mass budget.

Meteorological conditions, heat balance, mass budget, and glacier-runoff characteristics were investigated on the Abramov glacier in southwestern Kirgizia after the framework of the International Hydrological Decade. Results are presented of palynological observations and radar measurements of ice thickness, and problems relating to use of satellite data in the study of snow cover are described. (See W73-13351 thru W73-13359) (Josefson-USGS)
W73-13350

METEOROLOGICAL CONDITIONS IN THE ABRAMOV GLACIER BASIN (METEOROLOGICHESKIYE USLOVIYA BASSEYNA LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Z. A. Gerasimova, Yu. N. Yemel'yanov, and V. K. Nozdryukhin.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 3-35, Leningrad, 1972. 7 fig, 21 tab, 8 ref.

Descriptors: *Glaciers, *Meteorology, *Meteorological data, Synoptic analysis, Air temperature, Humidity, Wind velocity, Precipitation (Atmospheric), Clouds.
Identifiers: USSR, *Abramov Glacier (USSR).

Meteorological conditions were investigated at 3 observation stations on the Abramov Glacier in southwestern Kirgizia in 1967-70. The meteorological elements described include air temperature, humidity, wind velocity (direction and speed), precipitation, and cloudiness (type and amount of clouds). (See also W73-13350) (Josefson-USGS)
W73-13351

HEAT BALANCE OF SURFACES OF THE ABRAMOV GLACIER AND LATERAL MORAINE IN SUMMER (TEPLOVOY BALANS POVERKHNOSTEY LEDNIKA ABRAMOVA I BEREGOVOY MORENY V LETNIY PERIOD),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Z. A. Gerasimova.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 36-44, Leningrad, 1972. 3 fig, 5 tab, 11 ref.

Descriptors: *Glaciers, *Glacial drift, *Surfaces, *Heat balance, *Summer, Heat flow, Temperature, Evaporation, Radiation, Meteorology, Ice, Curves, Equations.
Identifiers: USSR, *Abramov Glacier (USSR).

Radiation characteristics of ice and moraine surfaces were investigated in heat-balance studies on the Abramov Glacier in southwestern Kirgizia in July-August 1969. Large differences were observed in the values of all items in the heat balance of glacier and moraine surfaces. Radiation balance of the glacier for clear days in July averaged 303.5 cal/sq cm and that of the moraine was 368.4 cal/sq cm. A large portion of the glacier's total heat income (71.4% in July and 79.6% in August) is the radiation balance. For bare ice, heat losses to melting are considerably higher than heat losses to evaporation. For moraine, heat losses to evaporation predominate over other values in the total heat expenditure. (See also W73-13350) (Josefson-USGS)
W73-13352

MASS BUDGET OF THE ABRAMOV GLACIER (BYUDZHET MASSY LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Yu. N. Yemel'yanov, V. K. Nozdryukhin, and N. V. Petrov.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 45-51, Leningrad, 1972. 2 fig, 3 tab, 2 ref.

Descriptors: *Glaciers, Snowpacks, Ice, Firn, Ablation, Water equivalent, Snow surveys, Altitude, Elevation, Curves.
Identifiers: USSR, *Abramov Glacier (USSR), *Glacier mass budget.

Accumulation and ablation of snow and ice on the Abramov Glacier in southwestern Kirgizia were

investigated in snow surveying performed in 1967-70. Glacier mass budget during the period was negative, as evidenced by a loss of mass equal to 200 m and by a drop in surface level of the glacier tongue averaging 6 m. Changes in glacier mass budget with altitude for the 1969-70 budget year are graphed, and tables show ablation of snow and ice at different elevations in 1970, as well as accumulation and ablation of snow and ice (in mm of water equivalent) at an elevation of 3,800 m in 1967-70. (See also W73-13350) (Josefson-USGS)
W73-13353

SUSPENDED-SEDIMENT YIELD FROM THE ABRAMOV GLACIER BASIN (STOK VZVESHENNYKH NANOSOV S BASSEYNA LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. A. Akbarov, and V. A. Neupokoyev.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 60-72, Leningrad, 1972. 3 fig, 2 tab, 21 ref.

Descriptors: *Glacial sediments, *Sediment yield, *Sediment transport, *Suspended load, Suspended solids, Suspension, Turbidity, Discharge (Water), Seasonal, Curves.
Identifiers: USSR, *Abramov Glacier (USSR), *Koksu River (USSR).

The amount of sediment transported in suspension by the Koksu River was investigated in 1968-70 after the framework of the International Hydrological Decade. Suspended load of the river 0.4 km below the terminus of the Abramov Glacier was 41,630 metric tons in 1968, 28,690 metric tons in 1969, and 81,480 metric tons in 1970. Water discharge of the river 69.4, 58.8, and 80.7 million cu m, respectively. (See also W73-13350) (Josefson-USGS)
W73-13355

RADAR SOUNDING OF THE ABRAMOV GLACIER (RADIOLOKATSIONNOYE ZONDIROVANIYE LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. K. Ryumin.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 73-83, Leningrad, 1972. 4 fig 1 tab, 5 ref.

Descriptors: *Glaciers, *Analytical techniques, *Measurement, *Sounding, *Radar, Antennas, Instrumentation, Profiles.
Identifiers: USSR, *Abramov Glacier (USSR).

Results are presented of radar measurements of ice thickness of the Abramov Glacier in southwestern Kirgizia in the summer of 1970. Soundings were made with standard radar altimeters operating at a frequency of 440 mc. Ice thickness of the glacier was measured at 119 points over an area of 15 km. Maximum thickness of the ice was 170 m. Methods of investigation and possibilities of using radar as a sounding technique are discussed. (See also W73-13350) (Josefson-USGS)
W73-13356

AVERAGE ALBEDO VALUES OF GLACIERS DURING THE ABLATION SEASON (O SREDNIKH ZNACHENIYAKH AL'BEDO LEDNIKOV V PERIOD ABLYATSII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. G. Konovalov.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 111-122, Leningrad, 1972. 1 fig, 5 tab, 11 ref.

Descriptors: *Glaciers, *Ablation, *Albedo, Snowpacks, Ice, Firn, Surfaces, Cloud cover, Statistical methods, Estimating, Measurement, Variability, Equations.
Identifiers: USSR.

Data are presented on field measurements of albedo (in percent) on mountain glaciers of the world during the ablation season. Average albedo values are obtained for seven different types of glacier surfaces, and estimates are made of the reliability of these values. Results of a statistical analysis of albedo measurements on the Raygorodskiy Glacier in 1968 and on the Ayutor-2 Glacier in 1969 are tabulated, and quantitative characteristics are derived for the effects of cloudy conditions on reflective properties of a glacier surface. (See also W73-13350) (Josefson-USGS)
W73-13357

SOME CHARACTERISTICS OF MODERN GLACIERS IN THE NARYN RIVER BASIN (NEKOTORYYE CHERTY SOVREMENNOGO OLEDENENIYA BASSEYNA R. NARYNA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
L. G. Cherkasov, V. P. Fateyev, and Yu. P. Barbat.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 123-130, Leningrad, 1972. 2 tab, 8 ref.

Descriptors: *Glaciology, *Glaciers, *River basins, Mountains, Streams, Size, Shape.
Identifiers: USSR, *Naryn River (USSR).

New data on modern glaciers in the Naryn River basin in Kirgizia are based on on-site investigations in 1963-69, recent large-scale topographic maps, and aerial photographic surveys. In the river basin there are 2,074 glaciers, covering an area of 1,357.8 sq km. Glaciers are divided into three categories on the basis of size: (1) large glaciers (3-5 sq km or more), covering 36% of the glacier area of the basin; (2) medium-size glaciers (1-3 sq km), occupying 31% of the glacier area; and (3) small glaciers (smaller than 1.0 sq km), covering one-third of the glacier area. Occurring as independent and isolated sheets, glaciers are classified by shape as hanging, corrie, and valley glaciers. The firn line varies in height from 3,520 m in the west to 4,400 m in the east. (See also W73-13350) (Josefson-USGS)
W73-13358

DESCRIPTION OF GLACIER RECESSION IN THE AMU-DAR'YA RIVER BASIN FROM AERIAL PHOTOGRAPHIC SURVEY DATA FOR 1946-66 (KHARAKTERISTIKA OTSTUPANIYA LEDNIKOV BASSEYNA R. AMUDAR'I PO MATERIALAM AEROFOTOS'YEMKI 1946--1966 GG.),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. I. Ratsek.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 131-137, Leningrad, 1972. 1 fig, 4 tab, 10 ref.

Descriptors: *Glaciology, *Glaciers, *River basins, *Aerial photography, Mountains, Ice.
Identifiers: USSR, *Amu-Dar'ya River (USSR), *Glacier recession.

Glacier evolution was investigated in aerial photographic surveys performed in the glacierized zone of the Pamir-Alay mountain chain in 1946-66. Eight percent or 580 sq km of the glacier area in the Soviet part of the Amu-Dar'ya basin is currently in recession, which agrees with data for Central Tien Shan in the Akshiyrak basin, where about 10% of the glacier area is dead ice. Between 1946 and 1966 the area of the Lenin and Yazgulemdar Glaciers was reduced 0.8%. Assuming climatic conditions remain the same, 8% of the glacier area in the Amu-Dar'ya basin, equaling 11,700 sq km or 930 cu km of ice, may disappear in 200 years. The problem of glacier recession must be considered in terms of ice-melt and runoff fluctuations in preparing plans for the utilization of water and land resources in Soviet Central Asia. (See also W73-13350) (Josefson-USGS)
W73-13359

MONITORING SNOW WATER EQUIVALENT BY USING NATURAL SOIL RADIOACTIVITY,
National Weather Service, Silver Spring, Md
V. C. Bissell, and E. L. Peck.
Water Resources Research, Vol 9, No 4, p 885-890, August 1973. 5 fig, 6 ref.

Descriptors: *Snow cover, *Snowpacks, *Snow surveys, *Water equivalent, *Nuclear moisture meters, *Vermont, Radioactivity techniques, Gamma rays.
Identifiers: Sleepers River experimental watershed (Vt).

The attenuation by snow cover of natural gamma radiation emitted from the soil serves as an excellent index to the water equivalent of the snow cover. A small portable gamma ray detector was installed on a boom about 2 meters above the ground at Sleepers River watershed near Danville, Vermont. Comparison of gamma ray count with snow measurements indicates that the small unshielded gage could be used to measure snow water equivalent with a standard error of 1.5 cm. A major source of error was the deposition of radioactive aerosols on the snow surface by precipitation. The deviation of gamma ray count rates due to precipitation events is short-lived, and a simple editing procedure on the count rate time trace reduced the snow season standard error to 1.1 cm. The edited count rate yielded 6% error in the 5- to 13-cm water equivalent range, decreasing to 4% in the 25- to 40-cm water equivalent range. This measurement method could be extremely valuable in providing unmanned measurement of snow water equivalents at remote locations. (Knapp-USGS)
W73-13382

2D. Evaporation and Transpiration

A STOCHASTIC MODEL FOR THE OCCURRENCE OF MOISTURE IN VADOSE MEDIA,
Clemson Univ., S.C.
For primary bibliographic entry see Field 02G.
W73-13074

PHYSIOLOGY OF DAILY TRANSPIRATION RHYTHM IN WOODY PLANTS,
T. M. Khashes.
Ekologiya. Vol 2, No 6, p 28-32, 1971. Illus.
Identifiers: Acacia, Ash, Carbohydrates, Daily, Oak, Plant physiology, Poplar, Potassium, Sophora, *Transpiration, Willow, *Woody plants.

Comparative studies were made of different forest margins from 1967-69 to relate differences in daily transpiration rhythm to the physiological condition of the leaves. The objects were 17-18 yr old poplar, willow, acacia, sophora and oak trees in shelter-belts and along irrigation canals. Transpiration, ash, K and carbohydrate contents, and the content of total, free and bound water were determined. A correlation between the midday fall in transpiration intensity and daily dynamics of free

and bound water, assimilation products and mineral composition of the leaves was shown. This physiological regulatory mechanism decreased transpiration loss and guaranteed the normal course of biochemical processes under changing growing conditions.--Copyright 1973, Biological Abstracts, Inc.
W73-13095

INHERITANCE AND PHYSIOLOGICAL EFFECTS OF STOMATAL FREQUENCY IN BARLEY,
Funk Bros. Seed Co., Bloomington, Ill. Winter Wheat Research.
For primary bibliographic entry see Field 03F.
W73-13125

POTENTIAL EVAPORATION FROM PASTURE AND POTATOES AT ASPENDALE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
A. C. Dilley, and W. Shepherd.
Agric Meteorol. Vol 10, No 4/5, p 283-300, 1972. Illus.
Identifiers: *Australia (Aspendale), *Evaporation rates, Pasture, *Potatoes.

Evaporation rates associated with well-watered pasture, potato crops and bare soil at Aspendale, Australia, and environmental and biological factors which influence them, were examined in analyses based on a formula of the combination type. Ratios of potato and soil to pasture evaporation were 1.27 and 1.17, respectively. A decrease of pasture evaporation relative to pan evaporation of 19% over a 9-yr period is attributed to progressive changes of pasture composition. Increased medium-scale advection to the experimental area accompanied changes in the surroundings occurring over the period. Linear empirical relationships were derived relating measured evaporation from the vegetated and bare soil surfaces to that from a Class A water pan and to values computed by means of the combination formula. The correlation coefficients for grass and soil evaporation were >0.97. Those for potatoes were 0.94 and 0.90, for pan and computed evaporation, respectively. The correlations confirm the suitability of both the combination method and the Class A pan for estimating evaporation under conditions of generous watering. The lower correlations with potatoes are attributed to the more variable nature of the surface involved and to the greater sensitivity of potatoes to minor restriction of water supply.--Copyright 1973, Biological Abstracts, Inc.
W73-13296

NETWORK DENSITY OF TEMPERATURE PROFILE STATIONS AND ITS INFLUENCE ON THE ACCURACY OF LAKE EVAPORATION CALCULATIONS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
F. R. Crow, and S. D. Hottman.
Water Resources Research, Vol 9, No 4, p 895-899, August 1973. 3 fig, 2 tab, 4 ref. USBR Contract 14-06-D-5629.

Descriptors: *Evaporation, *Lakes, *Data collections, Oklahoma, Reservoir evaporation, Meteorology, Water temperature, Gaging stations, Statistical methods, Network design.
Identifiers: Lake Hefner (Okla).

The accuracy of lake evaporation determined by the energy budget method depends on the precision of measurement of the total thermal energy content of the lake, which in turn is related to the number and distribution of the temperature-measuring points. The number of sampling points to be used should be such that the error in the stored thermal energy is of the same magnitude as the error in the other terms in the energy budget. This problem was studied at Lake Hefner, a 2600-acre off-stream reservoir at Oklahoma City, Oklahoma. Ten evaporation periods of 1-week duration each were included. Stored thermal energy was calculated on the basis of temperature profiles taken at 5-foot depth increments at 19 locations uniformly spaced over the lake. Evaporation was determined by the energy budget method using stored thermal energy calculated on the basis of 1, 5, 11, or 19 temperature profile stations. Analysis showed the optimum number of stations to be 5, or one station per 520 acres. Using only one station resulted in an evaporation error of 8.2% at the deepest point of the lake. Increasing the number of stations from 5 to 19 resulted in an increase of accuracy of evaporation measurement of only 1%. (Knapp-USGS)
W73-13365

STUDIES ON THE TEMPERATURE AND WATER BALANCE OF CHOSEN PLANT SPECIES OF THE DRY AREA OF SANTA MARTA (COLOMBIA), (IN SPANISH),
Universidad Nacional de Colombia, Bogota.
R. Schnetter.
Beitr Biol Pflanz. Vol 47, No 2, p 155-213. 1971. Illus. English summary.
Identifiers: *Colombia (Santa Marta), Cucumis-Anguria, Heat resistance (Plants), Prosopis-Juliflora, Seasonality, Species, Stylosanthes-Hamata, *Temperature balance, *Transpiration, Tribulus-Cistoides, *Water balance.

Ecological studies were carried out at 2 observation sites (cactus thorn scrub, clearing of a semideciduous tropical lowland forest) in the xerophytic region of Santa Marta, Columbia. The temperatures, transpiration, water contents, and heat resistances of leaves from several plant species were studied. During the wet season, and on the clearing of the semideciduous lowland forest with its more favorable water conditions also during the dry season, the leaf temperatures generally reached about 35C at noon; only rarely temperatures higher than 40C were observed. The leaf temperatures of smaller plants (Cucumis anguria, Stylosanthes hamata, Tribulus cistoides) often were lower than the temperature of the air in their environment near the ground (up to 5C). Lower water contents of leaves caused by the water stress in the dry season were correlated with reduced transpiration rates and elevated transpiration resistances (Prosopis juliflora and Tribulus in the cactus thorn scrub). Under these conditions, the leaves of Tribulus reached temperatures as high as 53C causing heat damage. Some examples for the energy exchange between leaves and environment are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-13385

ON THE SIGNIFICANCE OF ANTITRANSPIRANTS FOR TROPICAL CULTIVATED PLANTS, (IN GERMAN),
Giessen Univ. (West Germany). Lehrstuhl Botank (II).
L. Steubing, R. Herrmann, and R. Michler.
Mitt Inst Colombo-Aleman Invest Cien Punta De Betin. 5. p 19-29. 1971. Illus. English summary.
Identifiers: *Antitranspirants, Cresopinol, Cultivated, Leaf, Manihot-Esculenta, Octodecanol, Phaseolus-Vulgaris, Temperature, Toxicity, Transpirants, Trifolium-Repens, Triton, Tropical plants, Water transport (Plants), *Foliar sprays.

The influence of different foliar sprays as antitranspirants (0.1-0.5% Octodecanol, 15% Triton, 10% Cresopinol, 1% oil emulsion) was tested on Trifolium repens, Phaseolus vulgaris and Manihot esculenta under field and greenhouse conditions. The water loss of these plants decreased considerably after application. A remarkable reduction of the speed of water transport in the stem was measured as well as decline of both transpiration and water deficit of the leaves. Decreases of leaf temperatures and porometer values were observed. Octodecanol was most efficient, follwed by Triton 500. A spray of oil caused infiltration and toxic effects; the same influences have been noted after application of Cresopinol, but somewhate less frequently.--Copyright 1973, Biological abstracts, Inc.
W73-13394

DIFFERENTIAL STOMATAL RESPONSE BETWEEN C3 AND C4 SPECIES TO ATMOSPHERIC CO2 CONCENTRATION AND LIGHT,
National Inst. of Agricultural Sciences, Konosu (Japan). Dept. of Plant Physiology and Genetics.
S. Akita, and D. N. Moss.
Crop Sci. Vol 12, No 6, p 789-793. 1972. Illus.
Identifiers: Amaranthus-Retroflexus, Atmospheric conditions, Barley, *Carbon dioxide, Dandelion, Differential, Foxtail, Hordeum-Vulgare, Light, Maize, Pigweed, Setaria-Viridis, Species, *Stomatal response, Taraxacum-Officinale, *Transpiration, Triticum-Aestivum, Wheat, Zea-Mays.

Transpiration measurements were made on attached leaves of potted plants or on excised leaves of native plants of 3 C3 species-wheat (Triticum aestivum L.), barley (Hordeum vulgare L.), and dandelion (Taraxacum officinale L.)--and 3 C4 species--maize (Zea mays L.), green foxtail (Setari viridis L.), and pigweed (Amaranthus retroflexus L.)--in different CO2 concentrations and light intensities. The experiments were begun with leaves in CO2-free air in light (0.4 cal/cm2/min, 400-700 nm) to open the stomata. Stomata of C3 species were less prone to closure than were stomata of C4 species as the light intensity was decreased or as the CO2 concentration was increased. The greater water use efficiency of C4 species may be due to part to the better control of water loss because the stomata are more responsive to environmental changes than are the stomata of C3 species.--Copyright 1973, Biological Abstracts, Inc.
W73-13398

DIURNAL FLUCTUATIONS IN SOIL WATER POTENTIAL,
Duke Univ., Durham, N.C. Dept. of Botany.
For primary bibliographic entry see Field 02G.
W73-13438

CLOUDINESS AS A GLOBAL CLIMATIC FEEDBACK MECHANISM: THE EFFECTS ON THE RADIATION BALANCE AND SURFACE TEMPERATURE OF VARIATIONS IN CLOUDINESS,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 02B.
W73-13441

EFFECT OF CLEAR CUTTING IN THE WATER REGIME OF THE PRINCIPAL FOREST TREES OF THE SEVAN SHORE, (IN RUSSIAN),
For primary bibliographic entry see Field 04A.
W73-13593

A DIGITAL REGISTRATION SYSTEM FOR NET PHOTOSYNTHESIS AND TRANSPIRATION MEASUREMENTS IN THE FIELD AND AN ASSOCIATED ANALYSIS OF ERRORS,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
E-D. Schulze, O. L. Lange, and G. Lembke.
Oecologia (Berl). Vol 10, No 2, p 151-166. 1972. Illus.
Identifiers: Digital systems, *Errors, *Field measurements, *Photosynthesis, *Transpiration.

A digital registration system used with temperature- and humidity-controlled cuvettes for net photosynthesis and transpiration measurements in the field is described. The associated errors of the measured parameters and calculated data are estimated. The digtalization is based on an analog registration which is of primary importance in the control of experimental conditions in the cuvettes. The digital system is connected to the analogue registration in series. The error associated with digitilization is 0.1% across 70% of the scale. This error increases to 0.2% between 3 and 30% on the scale due to a minor lack of linearity. The reproducibility of the digitalization is plus or minus 0.024%. The error associated with data transfer in the digitalization and the errors of the analog registration are estimated for temperature and humidity measurements (error of air and leaf temperature is plus or minus 0.1C; error of the dew point temperature is plus or minus 1.1C dew point). The effect of these errors on the calculation of relative humidity and the water vapor difference between the leaf and the air is determined using the progressive error law. At 30C and 50% relative humidity, the error in relative humidity is plus or minus 7.4%, the error for the water vapor difference is plus or minus 6.6%. The dependence of these errors on temperature and humidity is shown. The instrument error of the net photosynthesis measurement is calculated to be plus or minus 4.2%. Transpiration measurements have an average inaccuracy of plus or minus 8.3%. The total diffusion resistance which is calculated from values of transpiration and the water vapor difference has an average of plus or minus 10.9%. The sizable influence of errors in humidity and temperature measurements on the calculated diffusion resistance is demonstrated. The additional influence of biological errors associated with field measurements is discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-13597

AN EXPERIMENT DETERMINING THE TOTAL EVAPORATION FROM A FIELD OF A PLANNED IRRIGATION BLOCK OF LAND IN SOUTHERN MUGAN OF AZERBAIDZHAN SSR, (IN RUSSIAN),
S. A. Kurbanov.
Izv Akad Nauk Az SSR Ser Biol Nauk. p 61-67, 1971. Illus.
Identifiers: *Azerbaidzhan-SSR (Mugan), *Evaporation, Irrigation, Land use, Temperature, USSR, Planning.

Dependence E ± Alpha Eo, in which Eo stands for evaporation, and alpha is a parameter indicating the effect of temperature gradients and air moisture on total evaporation, enables the calculation of the course of average daily evaporation. This is possible with common analysis of water and heat balance elements with regard to biological development of plants. This method can be also used for calculating irrigation terms and norms in planning hydroeconomic objects according to available hydrometeorologic observations.--Copyright 1973, Biological Abstracts, Inc.
W73-13605

A BATTERY DRIVEN MEASURING APPARATUS FOR THE ELECTRICAL REGISTRATION OF EVAPORATION OR DEWFALL, (IN GERMAN),
Innsbruck Univ. (Austria). Institut Allgemeine Botanik.
A. Cernusca, and G. Cernusca.
Centralbl Gesamte Forstwes. Vol 89, No 2, p 61-74, 1972. Illus. English summary.
Identifiers: Computers, *Dewfall, Driven, Economy, Ecosystem, Electrical measurement, *Evaporation, *Evaporimeter, Temperature, Measurement, Weather, Plant physiology, Instrumentation.

A battery driven evaporimeter was developed which was applicable to any electric registration device as strip card recorders, electric event counters, printers, tape punches or desk computers. With this evaporimeter synchronous registration of evaporation and other meteorological and ecophysical parameters of the environment, as well as certain ecophysiological parameters can be carried out. Thus it constitutes a basis for causal analytic investigations of plant water economy and productivity and for other problems in the applied biology. Construction and operation of the evaporimeter were tested estensively. The calibration factor of the evaporimeter depends not only upon the various parameters of the device but also upon the temperature. Long term measurements carried out in difficult mountainous terrain determined adaptability of the device in ecosystem analyses and stability under severe weather conditions.--Copyright 1973, Biological Abstracts, Inc.
W73-13619

2E. Streamflow and Runoff

HYDROLOGIC RESPONSE OF MASSACHUSETTS WATERSHEDS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13034

WATER RESOURCES DATA FOR TEXAS, 1972: PART 1, SURFACE WATER RECORDS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 07C.
W73-13069

AN ANALYSIS OF SAMPLING-FREQUENCY ALTERNATIVES FOR FITTING A DAILY STREAM-TEMPERATURE MODEL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-13142

BAYESIAN HYDROLOGIC MODEL BUILDING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13144

DEVELOPMENTS IN APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC MODELING,
IBM Space Systems Center, Huntsville, Ala.
R. Ambaruch, J. W. Simmons, and L. D. James.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 661-676, (1972). 3 fig, 6 tab, 5 ref.

Descriptors: Hydrology, *Mathematical models, *Remote sensing, *Streamflow forecasting, *Tennessee River, *Watersheds (Basins), *Computer programs, Optimization, Simulation analysis, Feasibility, Calibration, Climatic data, Hydrologic data, Synthetic hydrology, Parametric hydrology.
Identifiers: Prediction, Sensitivity analysis, Historical data.

Progress and initial results in the first major part of a stream flow forecasting project, utilizing aircraft (and later space) derived imagery for watersheds of the Tennessee River Valley, are presented. The initial study phase, aimed at assessing the feasibility of applying remote sensing data to prediction of watershed performance, is approximately 30 percent complete. Demonstration of feasibility will lead to a means of prediction of the hydrological behavior of ungaged watersheds using remote sensed data to minimize time, effort, and cost of achieving these predictions. The watersheds chosen for calibration and simulation provide a wealth of climatological and streamflow historical data and aerial photographic and ground survey coverage. A computer program based on the Stanford Watershed Model IV and a companion parameter-optimization program are used to calibrate model parameters for the selected catchments, based on historical data. The accuracy of the models is shown by comparison of synthesized with observed streamflows. Sensitivity of the model's simulation results to variations in its model parameters has been analyzed for two watersheds. Methods of determining model parameters from physical characteristics observable or inferable from remotely acquired photographs, without the necessity of historical streamflow data, are discussed. (See also W73-13134) (Bell-Cornell)
W73-13146

A NOTE ON WIND AND WAVE CONDITIONS IN THE SOUTHERN GULF OF ST. LAWRENCE,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 02L.
W73-13207

MAGNITUDE AND FREQUENCY OF FLOODS IN SMALL DRAINAGE BASINS IN IDAHO--A DESIGN METHOD,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 04A.
W73-13208

STREAMFLOW DATA USAGE IN WYOMING,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W73-13306

CHARACTERISTICS OF THE HYDROLOGIC REGIMEN OF THE KOKSU RIVER IN 1970 (OSOBENNOSTI GIDROLOGICHESKOGO REZHIMA R. KOKSU V 1970 G.),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. A. Akbarov.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 52-59, Leningrad, 1972. 4 fig, 2 tab, 9 ref.

Descriptors: *Hydrology, *Regimen, *Rivers, Glaciers, Discharge (Water), Runoff, Floods, Low flow, Water levels, Water temperature, Air temperature, Meteorological data, Water sampling, Chemical analysis, Curves.
Identifiers: USSR, *Koksu River (USSR), Mineralization.

Characteristics of the water regimen of the Koksu River were investigated in 1970 in hydrological studies conducted 400 m below the terminus of the Abramov Glacier in southwestern Kirgizia after the framework of the International Hydrological Decade. Studies included observations of water levels, measurement of flow velocities and depths for determination of water discharges, water sampling for chemical analysis, and observations of water temperature. (See also W73-13350) (Josefson-USGS)
W73-13354

APPLICATION OF A SIMPLE HYDROLOGIC MODEL FOR RAINFALL-RUNOFF RELATIONS OF THE DALTON WATERSHED,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13362

TECHNIQUE FOR IMPLICIT DYNAMIC ROUTING IN RIVERS WITH TRIBUTARIES,
National Weather Service, Silver Spring, Md. Office of Hydrology.
D. L. Fread.
Water Resources Research, Vol 9, No 4, p 918-926, August 1973. 5 fig, 1 tab, 24 ref.

Descriptors: *Routing, *Streamflow forecasting, *Unsteady flow, Tributaries, Numerical analysis, Stage-discharge relations, Equations, Flood routing, Simulation analysis.
Identifiers: *Dynamic flood routing.

Prediction of transient flow in a river having a major tributary poses a problem for the streamflow forecaster. The interaction of storage and dynamic effects between the two rivers can be simulated efficiently by a mathematical model consisting of the two unsteady flow differential equations and of known stage time, discharge time, or stage-discharge relationships at the extremities of the rivers. Numerical solutions of discharge and water surface elevation are obtained from the differential equations at specified time intervals by an implicit finite difference technique. This produces successive systems of nonlinear equations that are efficiently solved by the Newton-Raphson iterative method in combination with an extrapolation procedure and a specialized direct method for solving a system of linear equations. The length of the specified time interval is not limited by computational stability; however, accuracy constraints may limit its size. Some numerical results are presented to illustrate the interaction between a river and a tributary when they are subjected to a flood wave of long duration. (Knapp-USGS)
W73-13363

USE OF CROSS CORRELATION BETWEEN HYDROLOGICAL TIME SERIES TO IMPROVE ESTIMATES OF LAG ONE AUTOREGRESSIVE PARAMETERS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 07C.
W73-13364

REGULAR MEANDER PATH MODELS,
Hull Univ. (England). Dept. of Geography.
R. I. Ferguson.
Water Resources Research, Vol 9, No 4, p 1079-1086, August 1973. 6 fig, 1 tab, 14 ref.

Descriptors: *Meanders, *Mathematical studies, *Mathematical models, Alluvial channels.
Identifiers: Topology.

Existing mathematical models for regular meander paths are shown to be members of a general family of differential equations in which the rate of change of curvature along the channel is an odd function of path direction and bends are symmetric. The physical assumptions of the general model and possible justifications of the particular cases are outlined. Each model is specified by one scale parameter (path or axial wavelength) and one shape parameter (maximum deviation, sinuosity, or maximum curvature). Exact analytic expressions for geometric properties of circular arcs, Fargue's spiral, Von Schelling's curve, and the sine-generated curve are presented and illustrated by dimensionless plots; the last three models are generally similar. Properties of natural meander bends show fair agreement with these three regular models, although bend size and shape vary along individual channels, possibly because of nonuniform floodplain topography and sediments. (Knapp-USGS)
W73-13370

ON THE WIND-DRIVEN CIRCULATION OF A STRATIFIED OCEAN,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
For primary bibliographic entry see Field 05B.
W73-13429

NAVIFACIAL TEMPERATURE AND SALINITY ALONG THE TRACK FROM SAMOA TO HAWAII, 1957-1965,
Stevens Inst. of Technology, Hoboken, N.J.
R. I. Hires, and R. B. Montgomery.
Journal of Marine Research, Vol 30, No 2, p 177-200, 1972. 10 fig, 30 ref.

Descriptors: *Ocean circulation, *Temperature, *Seasonal, *Heat flow, *Salinity, Oceanography, Ocean currents, Pacific Ocean, Thermocline, Thermodynamics, Isotherms, Sea water, Tropical regions, Data collections, Evaluation, Geophysics.
Identifiers: Transequatorial voyages, Pago Pago, Hawaii.

Data were collected by ships on the temperature and salinity of intake water from measurements taken every 4 hours on 78 transequatorial voyages between Pago Pago (14S 171W) and Honolulu (21N 158W) over a period of nine years. This time series of systematic measurements permits reliable estimates of certain climatological features. Anomalous conditions appear clearly in specific years. Navifacial temperature is portrayed by isotherms on a graph with latitude and time as coordinates, and navifacial salinity is portrayed by isohalines on a similar graph. Anomalously high temperatures, especially within 5 degrees of the equator, occurred during parts of the years 1957-1959 and 1963-1965. Mean annual variations also are portrayed against latitude. Of special interest, the equatorial thermal minimum is found to be lowest twice a year in Feburary and September, and some evidence is found that this double cycle is related to the strength of the trade winds near the equator. Salinity and precipitation are compared with each other in their variations with latitude and season; the results are inconclusive. (Jerome - Vanderbilt)
W73-13435

SPECTRA OF THE TEMPERATURE AND HUMIDITY FLUCTUATIONS IN THE MARINE BOUNDARY LAYER,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia).
For primary bibliographic entry see Field 07B.
W73-13455

UNBOUNDED STRATIFIED FLOW OVER A VERTICAL BARRIER,
Case Western Reserve Univ., Cleveland, Ohio. Div. of Fluid, Thermal and Aerospace Sciences.
For primary bibliographic entry see Field 08B.
W73-13459

WARM WATER ADVECTION IN THE SOUTHERN BEAUFORT SEA AUGUST-SEPTEMBER 1971,
Coast Guard Washington, D.C. Oceanographic Unit.
G. L. Hufford.
Journal of Geophysical Research, Vol 78, No 15, p 2702-2707, May 1973. 5 fig, 14 ref.

Descriptors: *Ocean currents, *Seasonal, *Heated water, *Advection, Oceanography, Ocean circulation, Summer, Pacific coast region, Temperature, Salinity, Density, Stratified flow, Thermal stratification.
Identifiers: *Beaufort Sea.

Oceanographic features of the Southern Beaufort Sea were studied during August-September 1971. The data indicated the presence of a relatively warm layer (0.1-5.0C) in the continental shelf waters. This situation has only been reported once previously. The layer averaging 25 meters in thickness was traced from 154 degrees 30 minutes west to 143 degrees 42 minutes west. The layer decreased in temperature toward the east but salinity remained relatively constant. Direct current measurements in the warm water layer indicate an eastward flow, suggesting a Bering Sea-Chukchi Sea origin. This hypothesis was supported by a water mass analysis. Investigation of available data indicated the presence of the warm water layer in the Southern Beaufort Sea during the summer in 10 of the 16 years examined. (Jerome - Vanderbilt)
W73-13466

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX D--SURFACE WATER HYDROLOGY.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 06B.
W73-13484

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX I--FLOOD CONTROL.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 06B.
W73-13489

FLOOD OF MARCH 19-20, 1970, METROPOLITAN BIRMINGHAM AND JEFFERSON COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-13521

2F. Groundwater

MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU THERMAL PROBE,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
M. A. Reiter, and A. R. Sanford.
Available from the National Technical Information Service as PB-222 465, $3.00 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Las Cruces Technical Completion Report No 027, 1973. 31 p, 4 tab, 11 fig, 2 ref. OWRR A-042-NMEX (1).

Descriptors: *Groundwater movement, *Thermal conductivity, Geophysics, Hydrogeology, Aquifers, *Boreholes, New Mexico, *Base flow, Measurement, Water temperature, Instrumentation, Testing.
Identifiers: *Thermal probe, *Groundwater flow measurement, Well geometrics, Cased borehole, Uncased borehole.

A thermal probe for the in-situ measurement of groundwater flow in a borehole was constructed and calibrated in a horizontal position. The probe is a long slender metal rod having a heat source along its entire length and a temperature sensor at its midpoint. When a constant quantity of heat is applied to the probe, the rise in temperature is inversely related to the rate of water flow past the probe. Full-scale calibration of the probe was considered necessary because theoretical studies oversimplify the interaction between the heated probe and the horizontal flow of groundwater. The apparatus for calibration consists of a central sand-filled chamber having a horizontal hole lined with well-screen in its center. The central chamber is hydrologically connected to two taller water-filled chambers that are used to control the rate of water flow. Over 40 calibrations of the thermal probe were made, but most of these tests were used to perfect experimental techniques. However, 8 of the calibration runs were considered sufficiently accurate to construct preliminary Master Curves. These curves indicate that if temperature differences of 0.1 degree Centrigade can be measured at the end of a two hour test, the probe is capable of distinguishing changes in rate of water flow of 0.0005 cucm/sec/sq/cm. (Creel-New Mexico)

W73-13013

SIMULATION OF COUPLED LEAKY AQUIFERS AND SURFACE-WATER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02A.
W73-13014

FINITE ELEMENT SOLUTION TO UNCONFINED GROUNDWATER FLOW WITH INFILTRATION,
Rhode Island Univ., Kingston. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-13031

WATER LEVELS AND SPRING DISCHARGES FOR SELECTED WELLS AND SPRINGS IN NEVADA, 1966-69,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-13043

DETECTION OF FRESH WATER AQUIFERS IN THE GLACIAL DEPOSITS OF NORTHWESTERN MISSOURI BY GEOELECTRICAL METHODS,
Missouri Univ., Rolla. Geophysical Observatory.
For primary bibliographic entry see Field 04B.
W73-13213

RELATIONSHIP BETWEEN THE CARBON ISOTOPE COMPOSITION OF SOIL CO2 AND DISSOLVED CARBONATE SPECIES IN GROUNDWATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-13360

HYDROCHEMICAL ENVIRONMENTS OF CARBONATE TERRAINS.
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02K.
W73-13361

ANALYTIC SOLUTION OF SPATIALLY DISCRETIZED GROUNDWATER FLOW EQUATIONS,
Geological Survey, Iowa City, Iowa.
L. K. Kuiper.
Water Resources Research, Vol 9, No 4, p 1094-1097, August 1973. 1 fig, 4 ref.

Descriptors: *Mathematical studies, *Groundwater movement, Numerical analysis, Finite element analysis.

The Galerkin procedure, when it is applied to the equation for horizontal two-dimensional flow of groundwater in a nonhomogeneous isotropic aquifer, generates approximating equations involving square matrices and column matrices. An analytic solution to the matrix equation is given. These methods are compared with the approximate numerical Crank-Nicholson procedure by applying both to a particular problem for which the unknown column matrix has 49 elements. The Crank-Nicholson procedure usually requires less computation time for the confined aquifer case but gives errors for drawdown averaging approximately 10%. The Crank-Nicholson procedure takes considerably more computation time for the unconfined case when elapsed time is long. (Knapp-USGS)
W73-13367

ON THE ANALYSIS OF 'SLUG TEST' DATA,
Geological Survey, Washington, D.C.
S. S. Papadopulos, J. D. Bredehoeft, and H. H. Cooper, Jr.
Water Resources Research, Vol 9, No 4, p 1087-1089, August 1973. 1 fig, 1 tab, 4 ref.

Descriptors: *Aquifer testing, *Drawdown, Groundwater movement, Transmissivity, Water yield, Storage coefficient.
Identifiers: *Slug tests.

Methods of analyzing 'slug test' data are reviewed, and additional type curves for the analysis of test data from formations with very low storage coefficients are presented. (Knapp-USGS)
W73-13369

ON THE UPTAKE OF TRITIUM BY SOIL WATER AND GROUNDWATER,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 02F.
W73-13372

ON THE UPTAKE OF TRITIUM BY SOIL WATER AND GROUNDWATER,
National Center for Atmospheric Research, Boulder, Colo.
D. H. Ehhalt.
Water Resources Research, Vol 9, No 4, p 1073-1074, August 1973. 1 tab, 5 ref.

Descriptors: *Tritium, *Tracers, *Soil water, *Groundwater, Soil bacteria, Evaporation, Precipitation (Atmospheric), Oxidation.

Tritiated molecular hydrogen in the atmosphere is oxidized by soil microorganisms and may contribute to the T input into soil with a rate of 5.4 T atom per sq cm per sec. Thus groundwater studies using HTO as a tracer should take this additional T input into account, and measurements of the uptake of HT by local soil, along with the T deposition by rain, may be required to give correct results. (Knapp-USGS)
W73-13372

EFFECT OF ACCRETION ON DYNAMICS OF GROUNDWATER BETWEEN TWO CHANNELS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
A. El Nimr.
Water Resources Research, Vol 9, No 4, p 1058-1064, August 1973. 6 fig, 5 ref.

Descriptors: *Groundwater movement, *Surface-groundwater relationships, *Mathematical studies, Recharge, Evapotranspiration, Water balance, Infiltration, Evaporation, Seepage.

The effects of infiltration and evaporation on groundwater level and on the amount of seepage to or from channels that bound an unconfined aquifer were studied mathematically. The actual free-surface boundary conditions as well as the exact differential equation were used to obtain the general solution. Three particular cases were studied in detail. In the first, the accretion is considered to be constant, whereas, in the second, it is considered to vary linearly with time. In the third, the accretion occurs only on a part of the aquifer but does not occur on the other parts. For the three cases, the rate of seepage is given in mathematical forms as well as in dimensionless curves. The free-surface profile was also drawn for several cases. A comparison with the solutions based on the Boussinesq equation is presented. These approximate solutions give satisfactory results for shallow aquifers but fail to give reasonably adequate results for relatively thick aquifers. The results of these approximate methods deviate greatly from the exact solutions for small values of time. (Knapp-USGS)
W73-13373

CLOGGING IN SIMULATED GLACIAL AQUIFERS DUE TO ARTIFICIAL RECHARGE,
Illinois Univ., Chicago Dept. of Geological Sciences
For primary bibliographic entry see Field 04B.
W73-13374

VISCOUS FINGER WAVELENGTH DEGENERATION IN HELE-SHAW MODELS,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
S. P. Gupta, J. E. Varnon, and R. A. Greenkorn.
Water Resources Research, Vol 9, No 4, p 1039-1046, August 1973. 8 fig, 1 tab, 14 ref.

Descriptors: *Model studies, *Infiltration, *Hydraulic models, *Porous media, Oil-water interfaces, Mixing, Saline water intrusion.
Identifiers: *Hele-Shaw models, Multiphase flow.

The displacement of one fluid by another (miscible or immiscible) in porous media is an important phenomenon that occurs in groundwater movement and oil reservoir engineering. Practical examples are water flooding, solvent flooding, saltwater intrusion into coastal aquifers, and coning. Viscous fingering was studied in Hele-Shaw models. For an immiscible displacement, dispersive and relative permeability phenomena are absent. The investigation covered the entire scope of finger development from the incipient fingers predicted by Chuoke's theory to a parallel-sided single finger. Results of several experiments run in a Hele-Shaw cell with and without local heterogeneities show wavelength degeneration to one finger for different flow conditions and for different initial numbers of fingers. It was also found that the rate of growth develops almost immediately, well before the fingers are parallel sided. The mechanisms of wavelength generation and degeneration are discussed. (Knapp-USGS)
W73-13375

MODIFIED MONTE CARLO APPLICATION TO GROUNDWATER MOVEMENT--THE SIMULTANEITY PROCEDURES,
Central and Southern Florida Flood Control District, West Palm Beach.
S-F. Shih.
Water Resources Research, Vol 9, No 4, p 1029-1038, August 1973. 4 fig, 6 tab, 11 ref.

Descriptors: *Groundwater movement, *Monte Carlo method, *Mathematical studies, Soil water movement, Statistical methods, Computers, Drawdown, Computer programs.
Identifiers: Simultaneity procedures.

By applying the Monte Carlo methods to problems of water movement in soils, very difficult problems can often be treated easily, and solutions at only a few points in a flow system can be obtained independently. A modified Monte Carlo application, termed the simultaneity procedure, hastens the classical Monte Carlo application. So that the simultaneity procedure can be used more widely, the techniques of a parallel simultaneity procedure and a successive simultaneity procedure were devised. Examples are presented not only for the problems of groundwater movement and Thiessen coefficients but also for the problems of general mathematics. Comparisons of results indicate that the simultaneity procedure has the same accuracy as the classical Monte Carlo method, but the computing time is reduced by approximately 30%-60%. (Knapp-USGS)
W73-13376

EQUATION FOR ONE-DIMENSIONAL VERTICAL FLOW OF GROUNDWATER: 1. THE RIGOROUS THEORY,
Centro di Ricerca IBM di Venezia (Italy).
G. Gambolati.
Water Resources Research, Vol 9, No 4, p 1022-1028, August 1973. 14 ref.

Descriptors: *Groundwater movement, *Mathematical studies, *Unsteady flow, Porous media, Deformation, Equations, Elastic deformation, Elastic theory, Hydraulic conductivity, Saturated flow, Stress, Strain.

A new mathematical derivation of the one-dimensional flow equation in an elastic, saturated, porous medium is presented. The approach involves the consideration of a fixed elemental volume in fixed coordinates. The derivation is developed by starting from both Lagrangian and Eulerian definitions of the position vector. The Lagrangian and Eulerian formulations prove to be equivalent and provide the same outcome if they are correctly interpreted and consistently applied. The rigorous equation contains an additional nonlinearity resulting from the correct expansion of the partial spatial derivative of the grain velocity. It is also shown that an approach based on a deforming element in fixed coordinates is simple and straightforward, since it does not introduce the grain velocity into the development. However, it needs a particular definition for the compressibility different from the classical one. It is proved that these two compressibilities are not equal; their mathematical link is derived. (Knapp-USGS)
W73-13377

INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLICATIONS: 1. THE NATURE OF APPROXIMATE THEORIES,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Geofisica.
I. Herrera, and L. Rodarte.
Water Resources Research, Vol 9, No 4, p 995-1005, August 1973. 4 fig, 27 ref.

Descriptors: *Groundwater movement, *Mathematical studies, *Equations, Aquifer characteristics, Aquicludes, Hydrogeology.
Identifiers: *Leaky aquifers.

The dynamics of leaky aquifers are described by a system of integrodifferential equations. Alternative expressions for the memory functions are obtained, and it is shown that approximate theories of leaky aquifers correspond to several ways of approximating the memory functions. By means of analysis of these functions in the time domain it is possible to achieve a better understanding of the nature of these approximations as well as to foresee the possibility of their application to new situations. These types of results constitute important steps toward making the integrodifferential equations a powerful method of analysis of the very complex situations arising in the study of actual leaky aquifer systems. They can also be used to construct improved, simplified methods for numerical computation. (Knapp-USGS)
W73-13378

EFFECT OF SOLUTE DISPERSION ON THERMAL CONVENTION IN A POROUS MEDIUM LAYER,
Technion-Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
H. Rubin.
Water Resources Research, Vol 9, No 4, p 968-974, August 1973. 2 fig, 9 ref.

Descriptors: *Convection, *Dispersion, *Groundwater movement, *Saline water intrusion, Mixing, Mathematical studies, Water temperature, Salinity, Steady flow, Unsteady flow.

Thermal convection may sometimes play an important role in salt diffusion in an aquifer. In such cases hot saline water is in the deep layers of the aquifer, from which salt diffuses into the upper freshwater. Often the horizontal steady flow of the water in the aquifer increases the rate of diffusion of solutes. Salt diffusion is then characterized by the anisotropic dispersion tensor. Dispersion of the solutes reduces the stabilizing effect of the salinity profile but increases the stability of the flow field to pure overstable motions. Dispersion also changes the dimensions of Benard cells in the porous medium. Fluctuations of the dispersion tensor affect the stability criteria of the flow field but cause very small overstable motions that distort the convective current cells. (Knapp-USGS)
W73-13381

GROUNDWATER HYDROLOGY OF PRAIRIE POTHOLES IN NORTH DAKOTA,
Geological Survey, Washington, D.C.
C. E. Sloan.
Available from GPO, Washington, D C 20402 Price $0.70. Geological Survey Professional Paper 585-C, 1972. 28 p, 22 fig, 2 plate, 1 photo, 7 tab, 29 ref.

Descriptors: *Hydrogeology, *Surface-groundwater relationships, *Grasslands, *Lakes, Playas, Glacial drift, Water balance, Evapotranspiration, Groundwater movement, Salinity, Water table, *North Dakota.
Identifiers: *Prairie potholes.

Prairie potholes are water-holding depressions of glacial origin in the prairies of the Northern United States and southern Canada. Because potholes generally do not overflow, seepage outflow is the principal way in which dissolved salts can be removed. Salinity of pothole water is therefore a good indication of the seepage balance. Net seepage outflow results in fresh to brackish waters that constitute ephemeral to semipermanent ponds, whereas net seepage inflow results in brackish to saline waters that constitute semipermanent to permanent ponds. Because the water table in the glacial deposits is continuous with the water surface in prairie potholes, the water-table gradient is adjusted to the water-surface elevation of the potholes. Groundwater flows toward the pothole if the adjacent water table is higher than the pothole water surface and flows away from the pothole if the adjacent water table is lower than the pothole water surface. Prairie potholes were studied in North Dakota on the Coteau du Missouri, an area of stagnation moraine. Because joints in glacial till are most numerous near the land surface (owing to weathering effects), the most active groundwater flow systems are shallow and localized in the vicinity of potholes. As a result, local groundwater flow systems have a noticeable effect on pothole hydrology, particularly the salinity. (Knapp-USGS)
W73-13383

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX E--GROUND WATER AND GEOLOGY.
For primary bibliographic entry see Field 06B.
W73-13485

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1972.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-13515

WATER RESOURCES AND GEOLOGY OF MOUNT RUSHMORE NATIONAL MEMORIAL, SOUTH DAKOTA,
Geological Survey, Washington, D.C.
J. E. Powell, J. J. Norton, and D. G. Adolphson.
Available from GPO, Washington, D.C. 20402 Price $1.25. Water-Supply Paper 1865, 1973. 50 p, 9 fig, 1 plate, 3 tab, 20 ref.

Descriptors: *Groundwater resources, *Water supply, *National parks, Geology, Hydrogeology, Joints (Geologic), National monuments, Alluvium, Aquifers, *South Dakota.
Identifiers: *Mt. Rushmore National Memorial (S. Dak).

Groundwater suitable for public supply can be obtained from fractured metamorphic and igneous rocks at Mount Rushmore National Memorial, S. Dak. Mica schist is the most abundant rock in the memorial. The more prominent hills and mountains, however, are in large, northerly striking granite sills, some of which are several hundred feet thick. Pegmatite sills and dikes are also numerous. At some locations in the memorial, granite or pegmatite sills act as groundwater dams preventing the movement of groundwater down gradient. The occurrence of groundwater is dependent upon the presence of joints and fractures in the schist and granite bedrock. The rocks themselves are relatively impermeable and would yield little or no water in their unaltered state. Groundwater is also available from alluvium in major valleys such as Starling basin and the valleys of Grizzly Bear Creek and Battle Creek. Several locations in the memorial have potential as future sources of groundwater supplies. Developed and potential water resources in the memorial probably are sufficient to meet demands beyond the year 2000. (Knapp-USGS)
W73-13522

SUBSIDENCE OF THE VENICE AREA DURING THE PAST 40,000 YR,
Laboratoire de Geologie Dynamique, Paris (France).
J. Ch. Fontes, and G. Bortolami.
Nature, Vol 244, No 5415, p 339-341, August 10, 1973. 2 fig, 16 ref.

Descriptors: *Land subsidence, *Withdrawal, *Drawdown, *Paleohydrology, Radioactive dating, Sedimentation, Stratigraphy, Carbon radioisotopes.
Identifiers: *Venice (Italy).

Subsidence of the Quaternary deposits of the plain of Venice may be the result of geological factors or of human activity over several centuries, such as overexploitation in the confined aquifers and urban and industrial development on unconsolidated sediments. The respective contribution of the factors affecting subsidence may vary from place to place. Drilling, continuous coring, and seismic profiles provide average sedimentation rates of about 0.5 to 1.0 mm per yr since the Upper Pliocene. Geodesic studies, available since the early 1900's show that in some places the surface is now sinking at a velocity close to 8 mm per yr. In order to study the geological component of subsidence at an intermediary time scale, systematic analysis of the chronology of the upper Quaternary deposits was undertaken using C-14 measurements. From about 40,000 to 22,000 yr BP the correlation between age and depth is linear. The slope is about 1.2 mm per yr. Between 22,000 and 18,000 yr BP a high sedimentation rate (about 4 mm per yr) produced at least 17 m of deposits. The rate of marine deposition decreased between 5,900 and 2,020 yr BP. The beginning of human settlement in the area seems to have coincided with a period of ground stability. (Knapp-USGS)
W73-13526

THE SIGNIFICANCE OF THE SOLUTION OF FELDSPAR IN POROSITY DEVELOPMENT,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 02J.
W73-13537

THEORY AND PROBLEMS OF WATER PERCOLATION,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08D.
W73-13563

2G. Water in Soils

TRANSIENT VIBRATION TECHNIQUES TO DETERMINE WAVE VELOCITIES IN-SITU,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
D. Raghu.
M Sc Thesis, 1972. 215 p, 23 fig, 6 tab, 67 ref, 11 append. OWRR A-026-KY (2).

Descriptors: *Seismic studies, *Seismic properties, *Soil dynamics, *Foundation investigations, *Seismic waves, Exploration, Soil physical properties, Soil investigations.
Identifiers: Seismic wave velocities.

Seismic velocity profiling was tested at two sites by two seismic refraction methods, the sledge hammer method and the crosshole shooting method. Reliable measurements of shear wave velocity in field could be made from crosshole shooting data, provided data were interpreted properly. A new method to determine R-wave velocities uses the data from the sledge hammer method. A procedure is outlined for conducting crosshole shooting. In the Laboratory, resonant column tests were run to determine shear wave velocities for the two test sites. The laboratory and field shear wave velocities were correlated by taking into account the sample disturbance and time effects. (Knapp-USGS)
W73-13055

A STOCHASTIC MODEL FOR THE OCCURRENCE OF MOISTURE IN VADOSE MEDIA,
Clemson Univ., S.C.
H-Ih. Chien.
PhD Thesis, August 1972. 138 p, 41 tab, 88 equ, 151 ref, append. OWRR-A-014-SC (4) and A-023-SC (3).

Descriptors: Hydrology, *Soil moisture, Behavior, *Simulation analysis, *Markiv processes, *Stochastic processes, *Model studies, *Rainfall-runoff relationships, Probability, Distributions, Predicting, Surface runoff, Storage, Deep percolation, Evapostranspiration, Precipitation, Digital computers, Optimization, Systems analysis.
Identifiers: *Vadose media, Vertical movements, Soil moisture losses.

Two- and six-state Markov chain models are developed to predict the periodic vertical distribution of moisture at the ground surface and within the layers of the soil profile. The probabilities of transition of moisture between the concerned states are estimated and generalized. Weekly data for the accumulated rainfall and surface runoff and the initial soil moisture storage were measured at the Clemson Research Watershed; the observed data (December 1965 through October 1969) are employed as the input of the proposed model. The associated transition probabilities are estimated and then optimized through a digital computer program based on theories of discrete stationary Markov chain and the maximum likelihood estimation. The predicted vertical distribution of moisture is found to approximate closely the actually observed distribution. The probabilities of losses of soil moisture due to deep percolation and evapotranspiration from various depths of the soil profile are determined. The probability of infiltration into the ground surface and the probability of evapotranspiration losses from the entire moisture storage are also estimated. These probabilities are useful in calculating the absolute amounts of deep percolation, evapotranspiration and infiltration, and in predicting the absolute amounts of moisture in soil layers. (Bell-Cornell)
W73-13074

STUDIES ON THE SOIL-WATER SYSTEM IN THE FIELD: II. STATISTICAL CONSIDERATION ON THE SOIL MOISTURE CONTENT (IN JAPANESE),
Utsunomiya Univ., Tochigi (Japan). Coll of Agriculture.
K. Soma.
Bull Coll Agric Utsunomiya Univ Vol 8, No 2, p 81-92, 1972. Illus. English summary
Identifiers: Distribution patterns, Moisture, Samples, Season, Size, *Soil moisture, Statistical methods, System.

In the soil layer of a lysimeter the distribution of moisture content is usually normal in 15 x 15 cm section sampling (n ± 36) but seems to be nonuniform in each layer. This was caused by compaction in the soil tank. The fluctuation of measured values is larger in the upper layers. If a risk ratio alpha ± 5% and an accuracy epsilon ± 5% are accepted, the necessary sampling number for estimating the population is about 10 for moisture content. The distribution of moisture content in whole year (n ± 254) is normal for every layer, but there is a fair difference between characteristics of these distributions. Soil moisture fluctuates more in summer than winter.—Copyright 1973, Biological Abstracts, Inc.
W73-13091

COMPEITTION BETWEEN GRASS AND CLOVER FOR PHOSPHATE: II. EFFECT OF ROOT ACTIVITY, EFFICIENCY OF RESPONSE TO PHOSPHATE, AND SOIL MOISTURE,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Grassland Div.
For primary bibliographic entry see Field 03F.
W73-13097

INFLUENCE OF SURFACE SOIL CONDITIONS ON DRYING IN EARLY SPRING,
Macdonald Coll., Montreal (Quebec). Dept. of Soil Science.
For primary bibliographic entry see Field 03F.
W73-13098

SALINITY AND DRAINAGE IN A BROWN CHERNOZEM IRRIGATED AT DIFFERENT MINIMUM MOISTURE CONTENTS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 03C.
W73-13109

NITROGEN BALANCE IN SOIL COLUMNS INTERMITTENTLY FLOODED WITH SECONDARY SEWAGE EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 05B.
W73-13116

DEFORMATIONAL STRUCTURES IN BRAZILIAN COASTAL DUNES,
Geological Survey, Denver, Colo.
E. D. McKee, and J. J. Bigarella.
J Sediment Petrology. Vol 42, No 3, p 670-681. 1972. Illus.
Identifiers: *Brazilian coastal dunes, *Dunes (Deformation), Roots.

Coastal dunes of Brazil differ considerably from desert dunes in their internal structure primarily because of differences in the degree of cohesion within the sand. The coastal dunes formed under conditions of high humidity and heavy rainfall, and the avalanching of sand on the lee sides of these dunes has produced many distinctive deformational structures characteristic of wet, cohesive sand. The roots of plants growing on the dunes have further contorted and ruptured cross-lamination in the dunes, forming additional distinctive structures.—Copyright 1973, Biological Abstracts, Inc.
W73-13123

WATER TRANSMISSION PROPERTIES OF AN ASPHALT BARRIER,
Minnesota Univ., St Paul. Dept. of Soil Science
J. P. Palta, G. R. Blake, and D. A. Farrell
Soil Sci Soc Am Proc Vol 36, No 5, p 709-714 1972. Illus.
Identifiers: *Asphalt barrier, Capillary potential, Discontinuities, Flow, Soils, *Water transmission, *Steady flowSoil columns)

The water transmission properties of an asphalt barrier were studied using samples taken from a barrier formed in Zimmerman fine sand. Steady flow experiments using a 9.0-cm diameter soil column showed that water movement through the barrier was affected by the capillary potentials on both sides of the barrier if these potentials exceeded a critical value or 'break point' which ranged from minus 32 to minus 20 cm depending on the flow rate. This steady value increased from minus 4.3 to minus 1.5 cm when the flow rate was increased from 0.009-0.058 cm/hr. The hysteretic flow properties of the barrier are explained using a model based on the following assumptions: flow occurs mainly through cracks of varying width, and the ratio of the draining to wetting potentials of the cracks exceeds unity and is independent of crack size.—Copyright 1973, Biological Abstracts, Inc.
W73-13126

INFLUENCE OF SOIL BULK DENSITY AND MATRIC PRESSURE ON SOIL RESISTANCE TO PENETRATION,
H. F. Mirreh, and J. W. Ketcheson.
Can J Soil Sci Vol 52, No 3, p 477-483 1972. Illus.
Identifiers: Bulk density, *Mathematical models, Matric pressure, *Soils (Clay loam), Soil penetration resistance, Regression analysis.

Cylinders of a clay loam soil were adjusted to different bulk density and matric pressure combinations to study soil resistance to a penetrating probe. Regression analysis of the penetrometer data was conducted. A 3-dimensional plot of the generated soil resistance values was constructed to illustrate the nature of the interaction. At any 1 bulk density in the range 1.0-1.5 g/cc, soil resistance values tended to pass through a maximum as soil moisture was removed over the matric pressure range 1.0-8.0 atm. The tendency was most pronounced at the lower bulk densities. Implications on root growth and soil management are briefly discussed.—Copyright 1973, Biological Abstracts, Inc.
W73-13127

POLLUTION OF KARST AQUIFERS,
For primary bibliographic entry see Field 05B.
W73-13203

COMPARATIVE EXTRACTION OF CHLORINATED HYDROCARBON INSECTICIDES FROM SOILS 20 YEARS AFTER TREATMENT,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 05B.
W73-13285

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED POROUS MEDIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 05B.
W73-13302

PHYSICAL PROBLEMS AND THEIR AMELIORATION IN SALTY SOILS,
Department of Overseas Trade, Canberra (Australia). Trade Commissioner Service.
L. A. Downey.

The Journal of the Australian Institute of Agricultural Science, Vol 37, No 4, p 314-326, December 1971. 5 fig, 88 ref.

Descriptors: *Alkaline soils, Australia, *Soil physical properties, *Hydrologic properties, *Hydraulic conductivity, Fracture permeability, Evaporation, Excess water (Soils), Gypsum, Benefits, Crop response, Land reclamation.
Identifiers: *Australia (Riverine Plain).

Sodic soils of the Riverine plain, Australia, present a problem because of their poor physical characteristics which tend to be unstable under the action of water, and disperse to form an infiltration barrier at the surface. Their hydraulic conductivity is low; and they are prone to high intensity cracking, along with an evaporation rate which may equal that from surface soil, causing the drying rate to accelerate. Strata with sodic properties may form in the subsoil and cause water logging problems in the surface layers. Application of gypsum has been shown to give short-term improvements: increased hydraulic conductivity, improved water intake and increased porosity. These improvements are manifested in improved germination and higher yields--at least with some crops. Tillage combined with gypsum applications may give short-term increases in water penetration. Long-term reclamation of sodic soils may never be achieved at a realistic cost level. Combining deep tillage+gypsum+nitrogen+pasture+accurate surface levels is suggested as the best solution at present. (Bahre-Arizona)
W73-13308

PEDOGENIC CALCITE ACCUMULATION IN ARID AND SEMIARID REGIONS OF THE INDO-GANGETIC ALLUVIAL PLAIN OF ERST--WHILE PUNJAB (INDIA)--THEIR MORPHOLOGY AND ORIGIN,
Ghent Rijksuniversiteit (Belgium). Geologisch Instituut.
J. L. Sehgal, and G. Stoops.
Geoderma, Vol 8, No 1, p 59-72. 1972.

Descriptors: *Calcareous soils, *Soil texture, *Calcite, *Saturated soils, *Saline soils, Alluvial fans, Arid lands, Soil chemical properties, Crystal growth.
Identifiers: *India (Punjab), Pedogenesis, Thar desert.

The evolution of the pedogenic calcite formation is investigated by studying the climate of the plain grades from arid and hot to semi-arid and hot to less hot, and the soils, respectively, from Camborthids, through Calciorthids and Ustochrepts, to Haplustalfs. Nine different forms of calcite accumulations from microcrystalline calcite to coarsely recrystallized crystallaria are distinguished and described. They may form combinations which are characteristic for specific soil conditions. An evolution pattern of different forms could be determined, not only within profiles, but also among different soil types of the sequence; the highest complexity being found in calcic horizons. Specific forms were observed in the saline and water-logged soils. The origin of the different calcareous accumulations is discussed and authigenic character of the calcitic nodules is propounded. In the scope of these findings, the use of the suffix Ca (Calcite) in horizon designation is considered. (Bahre-Arizona)
W73-13311

PRAIRIE SANDREED (CALAMOVILFA LONGIFOLIA): WATER INFILTRATION AND USE,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 02I.
W73-13312

A COMPARATIVE STUDY OF SOIL VERSUS FOLLAR APPLICATION OF AMMONIUM NITRATE TO WHEAT UNDER DIFFERENT MOISTURE REGIMES,
Newe Yaar Experiment Station (Israel). Div. of Forage Crops and Pasture.
For primary bibliographic entry see Field 03F.
W73-13313

EFFECT OF WASTE WATER FROM THE ASTRAKHAN CELLULOSE-PASTEBOARD PLANT ON SOIL PROPERTIES,
For primary bibliographic entry see Field 05D.
W73-13315

PLANT INDUCED SOIL SALINITY PATTERNS IN TWO SALTBUSH (ATRIPLEX SPP.) COMMUNITIES,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Rivernina Lab.
For primary bibliographic entry see Field 03C.
W73-13316

CHARACTERISTICS OF HANFORD SOIL AND AQUATIC SEDIMENTS.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-13342

RELATIONSHIP BETWEEN THE CARBON ISOTOPE COMPOSITION OF SOIL CO2 AND DISSOLVED CARBONATE SPECIES IN GROUNDWATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-13360

ONE-DIMENSIONAL CONSOLIDATION OF A CLAY LAYER WITH IMPEDED DRAINAGE BOUNDARIES,
Illinois Univ., Urbana. Dept. of Civil Engineering.
G. Mesri.
Water Resources Research, Vol 9, No 4, p 1090-1093, August 1973. 3 fig, 6 ref.

Descriptors: *Consolidation, *Clays, *Soil mechanics, *Drainage effects, Soil physical properties.

The main source of settlement of drained clays is often a single compressible layer bounded above and below by layers that contribute little to total settlement but that have coefficients of permeabilities and thicknesses such that they can be considered neither freely draining nor impervious. Furthermore, the top and bottom drainage layers can have unequal permeabilities and thicknesses. An analytical solution to the one-dimensional consolidation of a clay layer with unlike drainage boundaries is developed, and the results are presented in the form of consolidation versus time to facilitate their use by engineers. (Knapp-USGS)
W73-13368

NOTE ON THE INFILTRATION ADVANCE FRONT FROM BORDER IRRIGATION,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.
Water Resources Research, Vol 9, No 4, p 1075-1078, August 1973. 1 fig, 7 ref.

Descriptors: *Infiltration, *Border irrigation, Wetting, Soilwater movement, Numerical analysis, Water spreading.

The spreading of a water layer of constant thickness over a near horizontal soil surface is analyzed. The solution was applied consistently for short times. It estimates gravity effects properly by taking into account the pressure head of the water layer. An infiltration law valid for all times is also suggested to obtain numerical solutions in practical cases. (Knapp-USGS)
W73-13371

A NUMERICAL AND SIMILARITY ANALYSIS OF INFILTRATION INTO CRUSTED SOILS,
Purdue Univ., Lafayette, Ind.
L. R. Ahuja.
Water Resources Research, Vol 9, No 4, p 987-994, August 1973. 5 fig, 14 ref.

Descriptors: *Infiltration, *Soil water movement, *Surface sealing, *Impact (Rainfall), Numerical analysis, Soil surfaces, Earth-water interfaces, Soil compaction, Wetting, Unsaturated flow.
Identifiers: *Crusted soils, *Crusts.

One-dimensional, vertical infiltration of water through a crust of constant nonzero hydraulic resistance is theoretically examined by using a numerical solution and a similarity reduction of the problem. The soil-water content at the crust-soil interface increases with time to approach a predictable final steady water content asymptotically. A greater proportion of the flow takes place at intermediate to low water contents, and without an appreciable effect of gravity, as the crust resistance increases. For the water content at the crust-soil interface, the cumulative infiltration, and the wet front progress, simple expressions arise from the similarity reduction analysis, which is based on specific functional forms of the soil-water diffusivity and suction head, and a relatively small initial soil-water content. For early to intermediate times of flow, the similarity analysis describes adequately the calculated numerical solution flow data for Yolo soil. For intermediate to large times, a Green and Ampt type solution is linked to the similarity expression for cumulative infiltration with fair success. (Knapp-USGS)
W73-13379

SIMULTANEOUS TRANSPORT OF SOLUTES AND WATER UNDER TRANSIENT UNSATURATED FLOW CONDITIONS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil Physics.
E. Bresler.
Water Resources Research, Vol 9, No 4, p 975-986, August 1973. 5 fig, 22 ref.

Descriptors: *Unsaturated flow, *Unsteady flow, *Mass transfer, *Leaching, *Solutes, Groundwater movement, Convection, Dispersion, Mixing, Aqueous solutions, Path of pollutants, Numerical analysis, Finite element analysis.

Theoretical and mathematical tools are presented for analyzing transient one-dimensional vertical simultaneous transfer of noninteracting solute and water in unsaturated soils. The transient diffusion convection equation is solved numerically by an approach that eliminates the effect of numerical dispersion. The numerical results are compared with some analytical solutions for steady water flow. For transient infiltration the results are compared with field data. These comparisons indicate that the theory as well as the numerical method is reliable and can be used with confidence. Results are given for typical cases of infiltration, redistribution, and evaporation of water from the soil and their effect on dispersion coefficients and salt concentration profiles. (Knapp-USGS)
W73-13380

MONITORING SNOW WATER EQUIVALENT BY USING NATURAL SOIL RADIOACTIVITY,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 02C.
W73-13382

NITROGEN-FIXING BLUE-GREEN ALGAE OF SOILS, RICE FIELDS AND EPHEMERAL BASINS OF THE SOUTHERN UKRAINE, (IN RUSSIAN),
For primary bibliographic entry see Field 05C.
W73-13391

COPPER ACCUMULATION IN SOILS USED FOR HOP GROWING IN BAVARIA, (IN GERMAN),
Technische Hochschule, Munich (West Germany).
For primary bibliographic entry see Field 05B.
W73-13395

Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 05B.
W73-13416

SOIL CONTAMINATION. 2. PENETRATION OF RADIOACTIVE IONS PRESENT IN SOLUTIONS DUMPED ON THE SURFACE (CONTAMINATION DES SOLS. COMPORTEMENT DES IONS RADIOACTIFS DANS LES SOLS NON STURES),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 05B.
W73-13417

DISTRIBUTION OF CS137 IN SOILS AND VEGETATION ON THE ISLAND OF PUERTO RICO,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-13423

FIXING CATION INTERACTION WITH BLISTER-LIKE OSMOTIC SWELLING ON VERMICULITE CLEAVAGES,
Wisconsin Univ., Madison. Dept. of Soil Science.
K. Sridhar, and M. L. Jackson.
Available from NTIS, Springfield, Va., as Coo-1515-42; $4.00 in paper copy, $1.45 in microfiche.
Report COO-1515-42, 1972. 30 p, 6 fig, 2 tab, 15 ref.

Descriptors: *Cation exchange, *Silicates, *Clay minerals, *Expansive clays, Strontium radioisotopes, Osmosis, *Soil treatment, Soil contamination, Soil chemical properties, Absorption, Hydrate processes, Fallout.

Blister-like surface configurations on micaceous vermiculite, produced by osmotic swelling of the interlayers, were studied by replica electron microscopy and by electron microprobe analysis. It is hypothesized that trapping of hydrated cations (Ce, Mg, or fallout Sr90) in blisters occurs since the electrical double layer is thick there. Shrinkage of artificial blisters was greater by treatment with KC1 solutions as compared with solutions of more hydrated cations since the interlayer hydrated cations were more effectively removed. Treatment by 2-hr contact with 1N and 0.01N KC1 solutions completely collapsed artificially produce blisters but not natural blisters. (Bopp-ORNL)
W73-13425

VERTICAL MULCH EFFECTS ON SOIL WATER STORAGE,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
M. L. Fairbourn, and H. R. Gardner.
Soil Sci Soc Am Proc. Vol 36, No 5, p 823-827. 1972. Illus.
Identifiers: Diffusivity, Evaporation, *Mulch, *Soil-water storage, Watersheds, Infiltration, *Soil treatments.

Soil water storage for vertical mulch and furrow treatments on level soil surfaces and vertical mulch and nonmulch treatments with microwatersheds was evaluated in a constant temperature laboratory. The vertical mulch treatment on a level surface saved 30-40% more of the applied water than the furrow treatment. The efficiency of storage with vertical mulch was reduced by 17% when the surrounding soil surface was wet during water application. A microwatershed with vertical mulch stored 7-10% more of the applied water than a microwatershed without mulch. Depth of water infiltration and dry soil surface adjacent to the mulch appeared to be the factors that reduced evaporation losses from vertical mulch treatments. A comparison of scaled evaporation data with the diffusivity curve for the soil used demonstrated that the diffusivity equation was useful for predicting soil water loss by evaporation for microwatershed treatments of this experiment.--Copyright 1973, Biological Abstracts, Inc
W73-13436

DIURNAL FLUCTUATIONS IN SOIL WATER POTENTIAL,
Duke Univ., Durham, N.C. Dept. of Botany.
E. L. Fiscus, and M. G. Huck
Plant Soil. Vol 37, No 1, p 197-202. 1972. Illus.
Identifiers: *Diurnal fluctuations, Evapotranspiration, Numeric interpolation, *Psychrometers, Soils, Temperature, Transpiration, Soil-water potential, Hygrometry.

Field data collected from thermocouple psychrometers operated under the control of an automatic switching network and scanning system are presented. A numeric interpolation procedure is described which permits corrections for varying sensitivity of the psychrometers over a wide range of temperatures and water potentials. Psychometers installed in ceramic cups buried in soil permeated by an active root system showed a significant day-to-night fluctuation in water potential coincident with the evaporative demands of the plant.--Copyright 1973, Biological Abstracts, Inc.
W73-13438

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN FLOW,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 05G.
W73-13469

A STUDY OF THE BLUE-GREEN ALGAE FROM PADDY FIELD SOILS OF INDIA,
Allahabad Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-13498

IMPROVED MERCURY WELL FOR MULTIPLE TENSIOMETER SYSTEMS,
Agricultural Research Service, Mandan, N. Dak. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 07B.
W73-13523

COMPARISON BETWEEN COMPRESSIBILITIES OF SANDS AND CLAYS,
University of Southern California, Los Angeles. Dept. of Petroleum Engineering.
G. V. Chilingarian, C. T. Sawabini, and H. H. Rieke III.
Journal of Sedimentary Petrology, Vol 43, No 2 p 529-536, June 1973. 2 fig, 29 ref.

Descriptors: *Compressibility, *Sands, *Clays, Mechanical properties, Compaction, Hydrostatic pressure, Laboratory tests, Sedimentology.
Identifiers: *Compressibility (Uniaxial), *Compressibility (Triaxial).

The pore and bulk volume compressibilities of unconsolidated sands and clays were determined in triaxial and uniaxial compaction. The bulk compressibilities of unconsolidated sands ranged from 0.00074 to 0.00007 per psi at effective pressure range of 0 to 3,000 psi, whereas the pore volume compressibilities ranged from 0.001 to 0.0001 in the same pressure range using triaxial compaction. These values are greater by about 50% to 100% than those obtained on using uniaxial compaction equipment. The bulk compressibilities obtained on compacting montmorillonite clay saturated in sea water using the triaxial apparatus were found to be about 300% to 500% higher than those obtained on using uniaxial loading in the applied pressure range of 400 to 20,000 psig. A graph is presented comparing the compressibilities of various clays, sands, sandstones, shale, and limestone. Compressibilities of unconsolidated sands appear to be very close to those of clays. Compressibilities of the consolidated sandstones, shales, and carbonates range from 0.00001 to 10 to the minus 7th power per psi in the 500 to 15,000 psi pressure range. (Knapp-USGS)
W73-13534

EFFECTS OF PHOSPHORUS APPLICATION RATE, SOIL PROPERTIES, AND LEACHING MODE ON P-32 MOVEMENT IN SOIL COLUMNS,
Ohio State Univ., Columbus
For primary bibliographic entry see Field 05B.
W73-13553

BEHAVIOR OF DETERGENTS (ABS), BACTERIA, AND DISSOLVED SOLIDS IN WATER-SATURATED SOILS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-13560

EFFECT OF THE RATE OF APPLICATION AND THE VOLUME OF APPLIED WATER ON THE RATE OF MOBILITY OF CERTAIN INSECTICIDES IN CLAY SOIL,
Ain Shams Univ., Cairo (Egypt). Faculty of Agriculture.
For primary bibliographic entry see Field 05B.
W73-13579

APPARATUS FOR REMOTE CENTRALIZED MEASUREMENT OF SOIL HUMIDITY BY THE ELECTROMETRIC METHOD, (IN ITALIAN),
Turin Univ. (Italy). Istituto di Agronomia Generale e Coltivazioni Erbacee.
G. Luppi, and C. Grasso.
Riv Agron, Vol 5, No 4, p 303-304. 1971. Illus. English summary.
Identifiers: Apparatus, *Electrometric methods, Humidity, Measurements, *Remote measurement, *Soil humidity.

The apparatus is described. The method is based on the use of revolving telephonic selectors each of which, operated by a telecontrol switchboard, can contact 52 porous blocks successively.--Copyright 1973, Biological Abstracts, Inc.
W73-13582

THE SOILS OF THE VILLECARTIER FOREST,
Institut National des Sciences Appliquees, Rennes (France). Laboratoire de Mineralogie Geotechnique.
J. Esteoule, J. Guyader, and J. Touffet.
Bull Assoc Fr Etud Sol. No 2 p 29-46, 1971. Illus.
Identifiers: Acidic brown soils, Forest, *France (Villecartier Forest), Gley, Humus, Pedogenesis, *Soils, *Vermiculite.

The evolution of these soils is leading to the establishment of acidic brown soils characterized by an acid humus of the moder type, by very low pH's, a considerable desaturation of the complex, and the appearance of vermiculite as the primary

clay mineral. The pronounced acidity of the profile exerts a considerable flocculating effect on the clay-humus complex. The acid evolution and absence of leaching go together with the rather low precipitation that is regularly distributed throughout the year. The relatively flat topography and the muddy texture of the superficial formations create conditions favorable to hydromorphism. The considerable interference of this local factor on climactic evolution results in a complete range of profiles going from brown acidic soil to hydromorphous soils with pseudogley and gley. Polyphasic soils were also present. In some cases it was difficult to distinguish the characteristics resulting from present pedogenesis from those resulting from previous evolution.--Copyright 1973, Biological Abstracts, Inc.
W73-13604

SOLUBILITY OF MANGANESE IN THE PRESENCE OF SOIL CHEMICALS,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05B.
W73-13645

2H. Lakes

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER,
Illinois State Water Survey, Champaign.
T. E. Larson, F. W. Sollo, Jr., and F. F. McGurk.
Available from the National Technical Information Service as PB-222 496, $3.50 in paper copy, $1.45 in microfiche. Illinois Research Report No 68, July 1973. 49 p, 8 tab, 18 ref. OWRR A-051-ILL (1) and S-029-ILL (1). 14-31-0001-3513.

Descriptors: *Hardness (Water), *Calcium carbonate, *Magnesium, Scaling, Corrosion, Solubility, Ions, *Carbonates, *Bicarbonates.
Identifiers: *Dissociation constants.

The objectives were to evaluate the dissociation constants of the calcium and magnesium complexes with the hydroxide, carbonate, and bicarbonate anions at temperatures of 5, 15, and 25C. This work was conducted at ionic strengths in the range from .002 to .02, corresponding roughly to waters with total dissolved solids contents of 100 to 1,000 mg/l. The dissociation constants have been determined in terms of activities, so that they are valid at least over the range of ionic strengths at which the tests were made. A titration method was used to measure the effects of complex formation on the pH of reaction mixtures and appropriate computer programs were developed to calculate the dissociation constants. Dissociation constants have been developed for the complexes of calcium and magnesium with the hydroxide and carbonate anions at 5, 15, and 25C. The bicarbonate complex of magnesium was studied at 25C, but no reliable and valid dissociation constant for this complex was obtained from the study. It appears probable that the constant for the calcium bicarbonate complex may be equally difficult to evaluate. The development of reliable dissociation constants of the complexes studied in this project, and a method to utilize them in calculating pH would be an aid in producing water of high quality and preventing deterioration of water distribution systems.
W73-13004

SULFUR BUDGET OF LAKE SHELBYVILLE, ILLINOIS, AND THE EFFECTS OF SULFIDES UPON CHAOBORUS,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 05B.
W73-13005

THE EFFECTS OF ENRICHMENT ON LAKE SUPERIOR PERIPHYTON,
Wisconsin Univ., Eau Claire. Dept. of Allied Health.
For primary bibliographic entry see Field 05C.
W73-13011

DROGUE MEASUREMENTS OF THE CIRCULATION IN GRAND TRAVERSE BAY, LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
E. C. Monahan, G. T. Kaye, and E. D. Michelena.
Available from NTIS, Springfield, Va 22151 as COM-73-10541 Price $3.00 printed copy; $1.45 microfiche. Michigan University Sea Grant Program Technical Report 35 (MICHU-SG-73-202), February 1973. 35 p, 21 fig, 11 ref.

Descriptors: *Currents (Water), Data collections, *Lake Michigan, Measurement, Methodology, Buoys, Winds, Wind velocity, *Water circulation, *Michigan.
Identifiers: *Grand Traverse Bay (Lake Michigan), *Drogue techniques.

In 1970, an intensive multidisciplinary field study was initiated of Grand Traverse Bay of Lake Michigan. The portion of this study directed at obtaining a description of the currents, periodic and aperiodic, that exist in Grand Traverse Bay has involved two distinct types of current measurement: Lagrangian and Eulerian. The application of essentially conventional drogue techniques to the quasi-Lagrangian measurement of the circulation in Grand Traverse Bay and the results obtained are described. The first measurements were made in the west arm of Grand Traverse Bay on July 23, 1970, using four flag/buoy/Vee drogue units. The float proper is a 1.5-ft diameter, polyurethane disc, 9 inches thick. The polyurethane disc is armored with a fiberglass covering. A 10-ft long, thin-walled, electrical conduit passes through the center of the float and serves both as a mast for the flag and a rigid point of attachment for the drogue line. Each Vee drogue is composed of two 6- by 4-ft canvas panels laced to rectangular frames of thin-walled conduit. The two panels are hinged together along a pair of 6-ft sides. The effective depth of the current being measured is determined by the length of line used to suspend the Vee drogue beneath the flag-buoy. The drogue trajectories are plotted on charts. Each chart is accompanied by a wind history showing graphically the wind speed and direction. (Woodard-USGS)
W73-13033

USE OF COMPUTERS TO COMPUTE UNSTEADY WIND CURRENTS IN BODIES OF WATER AS ILLUSTRATED BY LAKE BAYKAL (PRIMENENIYE EVM DLYA RASCHETA NEUSTANOVIVSHIKHSYA VETROVYKH TECHENIY V VODOYEMAKH (NA PRIMERE OZ. BAYKAL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
N. A. Davtyan.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 182-191, Leningrad, 1972. 2 fig, 3 tab, 17 ref.

Descriptors: *Lakes, *Currents (Water), *Winds, Computers, Wind velocity, Wind tides, Turbulence, Water levels, Curves, Equations.
Identifiers: USSR, *Lake Baykal, *Wind currents, *Drift currents, Gradient currents, Isotachs.

The BESM-3M computer was used to compute wind currents in a deep body of water comparable to that of Lake Baykal (length--680 km; average depth--730 m). Curves are derived for current velocities, turbulent exchange coefficients, water levels, and depths of penetration of drift currents depending on the Chezy coefficient and the rate of increase in wind velocity. A graph shows the distribution of wind-current velocity with depth and in time. (See also W73-13045) (Josefson-USGS)
W73-13053

THE FALL OVERTURN AND WINTER COOLING IN LAKE SUPERIOR,
Texas Univ., Port Aransas. Inst. of Marine Science.
N. P. Smith.
Limnology and Oceanography, Vol 18, No 3, p 483-487, May 1973. 3 fig, 8 ref.

Descriptors: *Lake Superior, *Turnovers, *Mixing, Water temperature, Seasonal, Thermal stratification, Water circulation.

Daily average temperatures and standard deviations were computed from two nearshore time series from Lake Superior during the fall overturn and the following period of cooling in winter 1966-67. Temperatures from the 10-m level decrease irregularly to near 0 deg C by mid-February. Average temperatures from the 200-m level decrease to 1.9 deg C by late January. The water column becomes isothermal at 4 deg C in early December. Energy density spectra computed from both time series show energy values dropping off exponentially with decreasing period and no significant spectral peaks. (Knapp-USGS)
W73-13059

THE EFFECTS OF SEVERAL WEATHER DISTURBANCES ON THE SEICHES IN LAKE TRAVIS, TEXAS,
Texas Univ., Austin. Applied Research Labs.
G. E. Ellis, J. A. Shooter, and C. W. Horton, Sr.
Limnology and Oceanography, Vol 18, No 3, p 476-482, May 1973. 9 fig, 12 ref.

Descriptors: *Seiches, *Lakes, *Texas, Waves (Water), Winds, Storms.
Identifiers: *Lake Travis (Tex).

Experimental observations of the seiches in a branch of Lake Travis were made before and after passage of several weather disturbances. Power spectra present the changes in energy density occurring with the passage of a squall line, a fast moving cold front, and steady winds. Squall lines and fast moving cold fronts act as short impulses of energy for the seiche activity in Lake Travis. A duration of 60 sec was found for the impulse associated with the squall line. The duration for the fast moving cold front was less than 30 sec. The spectral lines of the seiche activity are highly developed, as one would expect, after steady northwest winds and also on a very calm summer day. (Knapp-USGS)
W73-13060

POSTDEPOSITIONAL OSMOTIC ADJUSTMENTS IN SEDIMENTS FROM SOAP LAKE, WASHINGTON,
Duke Univ., Durham, N.C. Dept. of Zoology.
For primary bibliographic entry see Field 02J.
W73-13064

WATER RESOURCES DATA FOR TEXAS, 1972: PART 1, SURFACE WATER RECORDS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 07C.
W73-13069

PHYTOPLANKTON POPULATION DYNAMICS AND DISTRIBUTION IN TWO ADJOINING LAKES IN SRINAGAR: I. MACROFLORA IN RELATION TO PHYTOPLANKTON,
Jammu and Kashmir Univ. (India). Dept. of Bioscience.
S. Kant, and P. Kachroo.

Proc Indian Natl Sci Acad Part B Biol Sci. Vol 37, No 4, p 163-188, 1971. Illus.
Identifiers: Chlorophyta, Copepods, Diatoms, Dinoflagellates, *Distribution patterns, *Flora, *India, Lakes, Myxophyceae, *Phytoplankton, Seasonality, Srinagar, Temperature, Hydrogenion concentration.

Ecology of Phytoplankton with respect to their distribution at different depths of water and associated hydrobiological factors (viz, temperature of water and atmosphere, pH and water level) and macrovegetation were studied in 2 adjoining (Indian) lakes during 1968-69. Observations were recorded at 3 depths; surface, 1 m, and bottom. The phytoplankton show 3 peaks; Mar.-April, July-Aug. and Oct.-Nov. Of these, the organisms showed 3 patterns; the diatom-dinoflagellate peak, the copepod peak, and the peak of varied phytoplankton and high zooplankton. Dominance of algae was in the order; Diatoms Chlorophyceae and Myxophyceae. A census of algae revealed about 100 genera and their frequency was determined. Distribution of algae in relation to dominant macroflora is given.--Copyright 1973, Biological Abstracts, Inc.
W73-13096

THE VERTICAL DISTRIBUTION OF SOME CILIATED PROTOZOA IN THE PLANKTON OF A EUTROPHIC POND DURING SUMMER STRATIFICATION,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-13101

UTILIZATION OF THE CRAYFISH ORCONECTES LIMOSUS AS FORAGE BY WHITE PERCH (MORONE AMERICANA) IN A MAINE LAKE,
Maine Cooperative Fishery Unit, Orono.
W. F. Reid, Jr.
Trans Am Fish Soc. Vol 101, No 4, p 608-612. 1972. Illus.
Identifiers: *Crayfish, Forage, Insects, Lakes, *Maine, Morone-Americana, Orconectes-Limosus, Osmerus-Mordax, *White perch.

White perch (Morone americana) under 201 mm long from a lake containing the crayfish Orconectes limosus ate mostly insects. Perch from 201 to 280 mm long fed upon insects, fish, and crayfish. White perch over 280 mm fed mainly upon crayfish. Young-of-the-year O. limosus were rarely utilized as forage by white perch. White perch under 201 mm long from a lake not having crayfish fed mostly upon insects but also ate fish. Perch over 200 mm long were almost exclusively piscivorous, the main forage fish being the rainbow smelt (Osmerus mordax).--Copyright 1973, Biological Abstracts, Inc.
W73-13106

EPIDEMIOLOGICAL STUDY ON CLONORCHIS SINENSIS AROUND LAKE BIWA, SHIGA PREFECTURE: II. SURVEY ON METACERCARIA INFECTION IN FRESHWATER FISHES AND ON HUMAN INFECTION WITH THIS PARASITE, (IN JAPANESE),
Kyoto Prefectural Univ. of Medicine (Japan). Dept. of Medical Zoology.
For primary bibliographic entry see Field 05C.
W73-13112

A COMPARISON OF THE ZOOPLANKTON COMMUNITIES IN SEVEN MOUNTAIN LAKES NEAR LILLEHAMMER, NORWAY (1896 AND 1971),
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 05C.
W73-13117

EFFECTS OF DDT UPON SALMON FROM SCHOODIC LAKE, MAINE,
Maine Dept. of Inland Fisheries and Game, Augusta.
For primary bibliographic entry see Field 05C.
W73-13120

GONAD MATURATION OF BROOK TROUT (SALVELINUS FONTINALIS) IN A HIGH MOUNTAIN LAKE UNDER A MODIFIED PHOTOPERIOD,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
G. L. Larson.
J Fish Res Board Can. Vol 29, No 8, p 1209-1211. 1972. Illus.
Identifiers: *Brook trout, *Gonad maturation, Lakes, *Photoperiod, Salvelinus-Fontinalis, Trout, *Oregon (Pratt Lake).

Gonad maturation of brook trout (S. fontinalis) in Pratt Lake appeared similar to those reported for other areas although the day-length cycle was greatly modified by snow cover that capped the lake until early summer.--Copyright 1973, Biological Abstracts, Inc.
W73-13128

MODELLING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FUTURE WATER SUPPLIES,
Sun Oil Co., Dallas, Tex.
For primary bibliographic entry see Field 04A.
W73-13140

GLUCOSE FLUX AT THE SEDIMENT-WATER INTERFACE OF TORONTO HARBOUR, LAKE ONTARIO, WITH REFERENCE TO POLLUTION STRESS,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-13236

THE DETERMINATION OF ALL DETECTABLE ELEMENTS IN THE AQUATIC PLANTS OF LINSLEY POND AND CEDAR LAKE (NORTH BRADFORD, CONNECTICUT) BY X-RAY EMISSION AND OPTICAL EMISSION SPECTROSCOPY,
Pittsburgh Univ., Pa. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-13261

DISTRIBUTION AND BACKGROUND LEVELS OF MERCURY IN SEDIMENT CORES FROM SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-13264

METHYLMERCURY: BACTERIAL DEGRADATION IN LAKE SEDIMENTS,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 05B.
W73-13267

SULPHATE DEPOSITION BY PRECIPITATION INTO LAKE ONTARIO,
Atmospheric Environment Service, Toronto (Ontario).
For primary bibliographic entry see Field 05B.
W73-13270

NETWORK DENSITY OF TEMPERATURE PROFILE STATIONS AND ITS INFLUENCE ON THE ACCURACY OF LAKE EVAPORATION CALCULATIONS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02D.
W73-13365

ECOLOGIC OBSERVATIONS ON THE HYDROPHILIC VEGETATION OF A SMALL LAKE OF MOUNT FUMAIOLO (APENNINES OF ROMAGNA), (IN ITALIAN),
Florence Univ. (Italy).
M. Raffaelli.
Identifiers: Clyzophytes, Ecologic studies, Haptophytes, *Hydrophilic vegetation, *Italy, Lakes, Rhizophytes, Spongophytes, Vegetation, Water plants.

The ecological conditions of the vegetation of a little lake, situated on the Tyrrhenian side of Monte Fumaiolo (Appennino Ramagnolo, Italy) were examined. According to the conditions of the environment (soil covered with shallow water, marshy or only damp, possible presence of a water current, seasonal variation of the water level) 3 different areas of vegetation, which correspond to as many aspects, have been distinguished: central area, intermediate zone and marginal zone. The latter has subsequently been divided into an outer peripheric belt and some more internal areas (water conveyors). The vegetation of each single zone was then examined, pointing out the life forms and their adaptiveness to the different hygric conditions. Clyzophytes prevail in the central and intermediate areas, with a considerable amount of haptophytes and rhizophytes, while spongophytes are scarce. On the marginal zone (outer belt and water conveyors) spongophytes are predominant, clyzophytes are scarce and water plants are completely absent.--Copyright 1973, Biological Abstracts, Inc.
W73-13384

PARASITE FAUNA AND SEASONAL CONTAMINATION OF COREGONUS LAVARETIS IN LAKE SEVAN,
L. K. Vartanyan, and Z. A. Mkrtchyan.
Biol Zh Arm. Vol 25, No 4, p 67-71. 1972.
Identifiers: Coregonus-Lavaretis, Fauna, Lakes, *Parasite fauna, Seasonal, *Lake Sevan (USSR).

Results obtained from experiments carried out during years 1970-71, in 4 different lakes are presented. A number of parasites affecting various parts of fish exists in these lakes. The size, the seasonal preference, the percentage of parasitism and intensity of parasitism are described and discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-13400

FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND. JULY 1, 1971-JUNE 30, 1972,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05C.
W73-13406

WIND-SWEPT WATER SURFACE IN LABORATORY COOLED BY APPLYING HEAT,
Naval Research Lab., Washington, D.C.
A. H. Schooley.
Journal of Marine Research, Vol 31, No 1, p 93-95, 1973. 1 fig, 1 ref.

Descriptors: *Laboratory tests, *Winds, *Radiation, *Water temperature, Data collections, Water, Heat, Air-water interfaces, Measurements, Evaluation, Heat balance, Temperature, Lakes, *Model studies.

In a 40 cm x 45 cm x 20 cm basin containing 16 cm of water an experiment was conducted which implies that there may be conditions on the sea where the surface may be warmer under a cloud shadow than in direct sunlight. Wind was directed across the surface of the water while heat from a 215 watt lamp was directed down on it. Measurements of water temperature, air temperature, net radiation,

and humidity were taken while the lamp was alternately switched on and off. When the lamp was on and all else was held constant the mean temperature of the near-surface water reached 21.1 C. When the lamp was off and all else was held constant the mean near-surface water temperature reached 21.9C. (Jerome - Vanderbilt)
W73-13434

SEASONAL VARIATIONS IN THE ROTIFER POPULATION OF THE NATRON CONTAINING WATERS OF KANEM (CHAD),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
A. Iltis, and S. Biou-Duwat.
Cah O R S T O M Ser Hydrobiol. Vol 5, No 2, p 101-112, 1971. Illus. English summary.
Identifiers: *Chad (Kanem), *Natron, *Rotifers, Seasonal variations.

Four species of Rotatoria are found in natroned temporary ponds and permanent lakes of the Kanem (Chad). The most important densities of population are in the temporary ponds. A very dense phytoplankton with Oscillatoria platensis may be unfavorable to the Rotatoria populations. Ionic concentration and temperature seem to play a preponderant part in the seasonal variations observed.--Copyright 1973, Biological Abstracts, Inc.
W73-13467

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX D--SURFACE WATER HYDROLOGY.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 06B.
W73-13484

CONSERVATION OF THE GREAT LAKES OF EAST AFRICA: A LESSON AND A WARNING,
Freshwater Biological Association, Ambleside (England).
G. Fryer.
Biol Conserv. Vol 4, No 4, p 256-262, 1972. Illus.
Identifiers: *Africa (Great Lakes), Conservation, Evolution, Fishery management, Fish, Invertebrates, Lakes, Management, Water pollution.

The Great Lakes of East Africa are not only the repositories of the world's 3 richest lacustrine fish faunas but also harbor unique assemblages of invertebrates. A few of these animals are illustrated. These lakes are of immense scientific interest, not merely by virtue of their richness in species, nor even because so many species are endemic, but as field laboratories of evolution whose operations we have scarcely begun to understand. They are also natural resources of great value, being enormous reservoirs of pure water, and the sites of fisheries producing many thousands of tons of fish per annum. Evidence is presented which unequivocally indicates that, by virtue of their tropical location and hydrological regimes, these lakes are much more susceptible to the damaging influences of O2-demanding pollution than their temperate-zone counterparts, and that, should they become contaminated, their renewal times are so great that a virtually irreversible catastrophe is possible. Evidence of the mismanagement of the fisheries of Lake Victoria is also presented and the danger of further uninformed exploitation pointed out. Certain apparent remedies are shown to be highly dangerous. The technology of fishing has advanced more rapidly than scientific understanding of the extremely complex ecosystems involved.--Copyright 1973, Biological Abstracts, Inc.
W73-13517

ECONOMIC CRITERIA FOR DECISIONS ON PRESERVATION AND USE OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 06B.
W73-13518

THE SEASONAL CYCLE OF PHEOPIGMENTS IN LAKE ONTARIO WITH PARTICULAR EMPHASIS ON THE ROLE OF ZOOPLANKTON GRAZING,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 05C.
W73-13572

THE OCCURRENCE AND DISTRIBUTION OF MERCURY IN THE SEDIMENTS OF PETIT LAC (WESTERN LAKE GENEVA),
Geneva Univ. (Switerzerland). Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-13588

TIDAL MARSH CILIATES (PROTOZOA): MORPHOLOGY, ECOLOGY, SYSTEMATICS,
New Hampshire Univ., Durham. Dept. of Zoology.
A. Borror.
Acta Protozool. Vol 10, No 1-5, p 29-72. 1972. Illus.
Identifiers: Chlamydodon-Lynchelliformis, *Ciliates, Ecology, Marshes, Morphology, New, New Hampshire, Paranophrys-Magna, Protozoa, Species, Systematics, *Tidal marshes, Trichotaxis-Pulchra, Trimyema-Pleurispirale, *New Hampshire.

Over 100 spp. of ciliates occur in New Hampshire saltmarshes. Anatomy, behavior, autecology, and systematic position of 29 spp. are discussed, including previously described species of the genera Coleps, Colpoda, Condylostoma, Dysteria, Frontonia, Geleia, Histriculus, Litonotus, Mesodinium, Nassula, Oxytricha, Paralembus, Parameciun, Placus, Plagiopyla, Pleuronema, Prorodon, Sonderia, Strombidium, Trachelonema, Trochilioides and Uropedalium. Four new species are described in the genera Chlamydodon, Paranophrys, Trachotaxis, and Trimyema (C. lynchelliformis, P. magna, Trimyema pleurispirale, Trichotaxis pulchra). Two species are transferred from Pseidocohnilembus to Paralembus. This serves as a reference for determination of interrelationships of these ciliates and associated environmental factors.--Copyright 1973, Biological Abstracts, Inc.
W73-13591

OXIDATION REDUCTION POTENTIALS, OXYGEN CONCENTRATION AND OXYGEN UPTAKE OF PROFUNDAL SEDIMENTS IN A EUTROPHIC LAKE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05C.
W73-13599

THE BIOLOGY OF THE WEST AFRICAN SHAD ETHMALOSA FIMBRIATA (BOWDICH) IN THE LAGOS LAGOON, NIGERIA,
Lagos Univ. (Nigeria). School of Biological Sciences.
S. O. Fagade, and C. I. O. Olaniyan.
J Fish Biol. Vol 4, No 4, p 519-533. 1972. Illus.
Identifiers: Biology, Distribution patterns, Ethmalosa-Fimbriata, Lagoons, *Nigeria (Lagos Lagoon), *Shad, Spawning, Fish populations.

The biology of the population of E. fimbriata occurring in the Lagos Lagoon was investigated. Three size groups, 35-69 mm (Yoyo), 70-169 mm (Efolo) and 170 mm and above (Agbodo) occur in the lagoon and the spatial distribution of these size groups and the length frequency distribution of the species is given. The relationship between length weight, age and growth is discussed and the food and feeding intra-relationship of the size groups is shown. Information on the fecundity and possible spawning periods is discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-13600

PHYTOPLANKTON IN LAKES OF THE SULAK RIVER BASIN IN DAGESTAN, (IN RUSSIAN),
Laboratory of Limnology, Leningrad (USSR).
I. S. Trifonova.
Bot Zh. Vol 56, No 11, p 1669-1674, 1971.
Identifiers: Dagestan (USSR), Ecology, Lakes, *Phytoplankton, Rivers, Species, *Sulak River basin (USSR), *Algae.

Data are presented on the species composition, abundance and ecological characteristics of algae of some typical lakes in the basin of the Sulak River.--Copyright 1973, Biological Abstracts, Inc.
W73-13606

CHARACTERISTICS OF DIATOMS OF PRESENT-DAY GLACIAL LAKES OF THE POLAR URALS,
V. N. Stenin.
Biol Nauk. Vol 15, No 5, p 66-73, 1972.
Identifiers: *Diatoms, Glacial lakes, Photosynthesis, Suppression, *Urals (USSR).

An analysis of 10 lakes of the polar Urals (USSR) showed that glacial lakes are poor in the composition of diatoms. Mountain-valley lakes far from glaciers are distinguished by considerable development of diatoms. Some sediments of such lakes may be characterized as diatomites. The diatoms of glacial lakes are represented only by Arctic species; many species of the temperate zone are present, in addition to northern alpine diatoms, in the mountain-valley lakes. Freshwater-brackish water species are absent in glacial lakes, except for single ubiquists; in mountain-valley lakes, these diatoms are found rarely or singly. Truly planktonic diatoms are almost completely absent in glacial lakes as a consequence of suppression of photosynthetic activity in the turbid water.--Copyright 1973, Biological Abstracts, Inc.
W73-13613

NATURE OF THE BOTTOM AND DISTRIBUTION OF BENTHIC ORGANISMS IN THE BOL REGION (EASTERN ARCHIPELAGO OF LAKE CHAD),
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
C. Dejoux, L. Lauzanne, and C. Leveque.
Cah O R S T O M Ser Hydrobiol. Vol 5, No 3/4, p 213-223, 1971. Illus. English summary.
Identifiers: Archipelago (Lakes), *Benthic organisms, Bottom, *Distribution patterns, Lakes, Mollusks, Oligochaeta, *Lake Chad.

The benthic organisms living in 5 different bottom deposits were sampled in a restricted area of the lake Chad eastern Archipelago. The analysis of the different samples shows that the granulometry of the bottom deposits plays an important part in the distribution of Oligochaeta and mollusks but a smaller part as far as insects are concerned. However, for these 3 groups, the originality of the populations living in the sandy bottom deposits is pointed out.--Copyright 1973, Biological Abstracts, Inc.
W73-13618

STUDY OF THE BIOLOGY OF PELOPIA PUNCTIPENNIS MG. (CHIRONOMIDAE, DIPTERA) IN THE MINGECHAUR RESERVOIR (IN RUSSIAN),
A. R. Khalilov.

Izv Akad Nauk Az SSR Ser Biol Nauk. 5/6, p 95-96, 1971.
Identifiers: Biology, *Chironomidae, *Diptera, *Mingechaur Reservoir (USSR), Pelopia-punctipennis, Reproduction, Reservoirs, Temperature, USSR.

In the Mingechaur reservoir (USSR), P. punctipennis produces 2 generations (April and Aug.). The females lay eggs within 50-65 hr at an air temperature of 12-16C. The number of eggs in each clutch varied from 400 to 680. The diameter of the clutches was 5.6-6.5 mm, the length of the eggs 0.35-4.0 mm, and the width 0.10-0.20 mm. The density of the larvae reached 680 larvae/m2 at a biomass of 0.40 g/m2.--Copyright 1973, Biological Abstracts, Inc.
W73-13621

HYDROBIOLOGICAL INVESTIGATION OF LAKE LERE AND NEIGHBORING PONDS: II. ROTIFERA,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
R. Pourriot.
Cah O R S T O M Ser Hydrobiol, Vol 5, No 2, p 171-174, 1971.
Identifiers: Distribution patterns, Hydrobiological studies, *Lake Lere (Chad), Ponds, *Rotifera.

Hydrobiological investigation of Lake Lere (Chad) and neighboring ponds revealed 14 species or subspecies of Brachionidae, 4 Lecanidae, 2 Notommatidae, 6 Trichocercidae, 3 Synchaetidae, 1 Asplanchnidae (Pseudotrocha); 5 Testudinellidae, 1 Conochilidae (Monimotrocha); and 1 Collothecidae (Collothecacea). Following special remarks on the form and size of Brachionus angularis, B. caudatus, Notommata sp., Trichocerca mucosa, and T. ruttneri, the distribution of rotifers found was discussed. A comparison of the species of Lake Lere and Lake Chad showed a similarity between the rotifer populations of these 2 lakes. Most of the forms of Lake Lere were cosmopolitan, and only 5 of them (less than 14%) were preferentially tropical or subtropical: Anuraeopsis coelata, Brachionus caudatus, Keratella tropica, Trichocerca ruttneri, and T. tchadiensis. All were species known for the African plankton populations taking into account certain confusions or possible synonomies such as Trichocerca similis and T. birostris.--Copyright 1973, Biological Abstracts, Inc.
W73-13636

2I. Water in Plants

CONTRIBUTIONS OF ALLOCHTHONOUS DETRITUS TO THE ENERGY REGIME OF DOE RUN, MEADE COUNTY, KENTUCKY,
Louisville Univ., Ky. Water Resources Lab.
For primary bibliographic entry see Field 05B.
W73-13056

THE EFFECT OF WATER AND SALT FLUXES ON THE TRANSROOT POTENTIAL IN HELIANTHUS ANNUUS,
Atomic Energy Agricultural Research Center, Tando Jam (Pakistan).
A. Q. Ansari, and D. J. F. Bowling.
J Exp Bot. Vol 23, No 76, p 641-650. 1972. Illus.
Identifiers: *Water Flux, Helianthus annuus, Ion transport, Roots, *Salt flux, *Sunflower roots.

The effect of an artifically imposed water flux on the trans-root electrical potential difference was studied in excised sunflower roots. The potential of the xylem sap became more negative with respect to the external medium as the rate of water flow was increased. This change appeared to be related to an accompanying increase in the flux of ions. The effect of increasing the water flux on the vacuolar potential difference of the epidermal cells was also investigated. It also became more negative with increasing water flux. Both potentials were measured simultaneously in the same root. On increasing the water flux it was found that the trans-root potential began to rise immediately but there was a time lag of approximately 2 min before the vacuolar potential began to change. The relevance of these potential changes to the mechanism and pathway of ion transport across the root is discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-13066

AN AQUARIUM TEMPERATURE CONTROL SYSTEM FOR FIELD STATIONS,
New York Cooperative Fishery Unit, Ithaca.
For primary bibliographic entry see Field 05C.
W73-13079

REACTIONS OF CANADA GEESE TO RESERVOIR IMPOUNDMENT ON THE SNAKE RIVER IN WASHINGTON,
Washington State Univ., Pullman. Dept. of Zoology.
For primary bibliographic entry see Field 06G.
W73-13082

PHYSIOLOGY OF DAILY TRANSPIRATION RHYTHM IN WOODY PLANTS,
For primary bibliographic entry see Field 02D.
W73-13095

NUTRIENT CONTENT OF LITTER FALL ON THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 02K.
W73-13100

EFFECT OF TEMPERATURES AND WATER TABLE DEPTH ON THE GROWTH OF CREEPING BENTGRASS ROOTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. S. Ralston, and W. H. Daniel.
Agron J. Vol 64, No 6, p 709-713. 1972. Illus.
Identifiers: Agrostis-palustris, *Bentgrass roots, Dew, *Grass growth, Infiltration patterns, Porosity, Roots, Sand, Size, *Temperatures, *Water table depth.

The PURR-WICK system provides an impermeable underlay, plus possible retention of free water by outflow drainage control. The effect in this system of sand texture, depth of water reserve and temperature was studied. 'Penncross' bentgrass (Agrostis palustris Huds.) was grown in columns of finer and coarser sand mixes with water tables maintained at depths of 11, 25 and 40 cm in constant temperature chambers of 15 and 30C for 9 wk. Temperature had the greatest effect. At 15C root growth was slow initially but steadily maintained. At 30C initial root growth was rapid but declined to little or no growth, so that total root length at 15C was 3 times that for 30C. Within each temperature the water table X sand interaction was significant. Root growth was better in the finer sand for the 40-cm treatment. Deepest root growth was found at 15C in the finer sand mix with the water table at 40 cm. Where O2 diffusion was favored by coarse texture, roots were still limited by higher temperature.--Copyright 1973, Biological Abstracts, Inc.
W73-13105

SOME ECOLOGICAL RELATIONSHIPS OF THE INVERTEBRATE DRIFT IN PRATERS CREEK, PICKENS COUNTY, SOUTH CAROLINA,
Oklahoma Univ., Norman. Dept. of Zoology.
W. K. Reisen, and R. Prins.
Ecology. Vol 53, No 5, p 876-884. 1972, Illus.
Identifiers: Biomass, Creek, Density, Dependence, Drift, Ecological studies, Ephemerella Sp, *Invertebrate drift, Praters, Relationships, *South Carolina (Praters Creek).

The role of organic drift in the ecology of a southern, upper Piedmont stream was evaluated from Sept 1967 to Aug. 1968. By sampling for a 24-hr period each mo., data on the diel and monthly fluctuations of the drift were obtained. Chemical and physical analyses of the water were made to evaluate the role of selected abiotic variables in the ecology of the drifters. Community biomass could not be estimated by drift because fluctuations in the standing crop were not significantly correlated with fluctuations in the drift rate. With the exception of Ephemerella sp. the drifters did not respond in a density-dependent fashion to benthic population increases. Drift seemed to be initiated by pupation or emergence activity. The diel drift for the majority of the benthos examined was decidely negatively photoactic. Pronounced crepuscular activity was observed for most of the hemimetabolous forms with a consistent midnight depression of activity.--Copyright 1973, Biological Abstracts, Inc.
W73-13107

ROOT DISTRIBUTION AND SOIL MOISTURE STUDIES IN SOME PERENNIAL RYEGRASS AND PHALARIS PASTURES ON SOUTHERN TABLELANDS, SOUTH-EASTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
E. W. Pook, and A. B. Costin.
Aust C S I R O Field Stn Rec. Vol 10, No 2, p 59-72. 1971. Illus.
Identifiers: *Australia, Clover, Grass, Lolium-Perenne, Pastures, Perennial, *Phalaris, *Root systems, *Rye grass, Soils, *Soil moisture, Subterranean, Tablelands.

Quantitative assessments were made of the distribution of perennial ryegrass (Lolium perenne L.) and phalaris (Phalaris tuberosa L.) root systems developed in typical perennial pastures intensively grazed by sheep on the Southern Tablelands of New South Wales and the Australian Capital Territory. At Wollogorang, near Goulburn, dominant perennial ryegrass was found to have superficial development of roots, with virtually full exploration of topsoil, but limited vertical extension of roots into subsoil. In sown pastures on the southern tablelands shallow-rooted species such as perennial ryegrass were seriously affected by the dry soil conditions experienced between 1965 and 1968. In phalaris-subterranean clover pastures at Ginninderra, near Canberra, phalaris roots did not fully exploit the topsoil, but in contrast to perennial ryegrass were found to have strong vertical extension of deep roots in subsoil. The survival value of the deep root system of phalaris during prolonged droughts was borne out by soil moisture measurements. There was pronounced drying out of the soil profile within and beyond the apparent level of root extension; nevertheless, some available water remained in the deeper subsoils to which the phalaris roots had access.--Copyright 1973, Biological Abstracts, Inc.
W73-13110

PRODUCTIVITY AND DISTRIBUTION OF TRICHOPTERA LARVAE IN A COLORADO MOUNTAIN STREAM,
Southern Methodist Univ., Dallas, Tex. Dept. of Biology.
J. O. Mecom.
Hydrobiologia. Vol 40, No 2, p 151-176. 1972. Illus.
Identifiers: *Colorado (St. Vrain River), *Distribution patterns, Larvae, Mountain streams, *Productivity, Stream, Temperature, *Trichoptera larvae.

From June 1968 to late May 1969, collection of more than 20,600 immature Trichoptera were made from the St. Vrain River of Colorado. Agapetus sp., Arctopsyche grandis, Brachycentrus americanus, Ecclisomyia maculosa, Hydropsyche sp., H. occidentalis, Helicopsyche borealis, Leptocella sp., Neothremma alica, Rhyacophila acropedes and Sortosa sp. were taken at 8 sites ranging from 1565 to 3200 m in altitude. The Trichoptera of the St. Vrain exhibited a distinct altitudinal zonation with Zone I (1565 m) dominated by Leptocella, Hydropsyche sp., and Helicopsyche borealis; Zone II (1750 to 2350 m) was dominated by Brachycentrus americanus and Hydropsyche occidentalis; Zone III (2350 m) was considered a transitional area. In Zone IV (2650 m) and Zone V (2950 to 3250 m) Neothremma alicia and Arctopsyche grandis were the most successful genera, respectively. Temperature is proposed as the major variable controlling altitudinal zonation. Standing crop productivity of Trichoptera was determined from timed collections and expressed as population density (number of organisms collected per 30 min) and organic biomass (dry organic matter represented by organisms collected per 30 min). Intermediate altitudes (2300 m) exhibited the lowest productivity but greatest species diversity. Highest productivity occurred below 1600 m but organic biomass was surprisingly high above 2900 m. Changes in productivity in relation to altitude are discussed in relation to temperature, food availability, severe flooding, and other variables. Productivity on a yearly basis was greatest in spring and at minimum levels during autumn and early winter. The holometabolous life cycle of Trichoptera, temperature, and current seem to be the major governing factors of seasonal productivity.--Copyright 1973, Biological Abstracts, Inc.
W73-13124

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (V): PELAGIC POLYCHAETES OF THE CENTRAL ARCTIC BASIN,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W73-13233

APPARATUS FOR SEMI-CONTINUOUS CULTURE OF DAPHNIA,
For primary bibliographic entry see Field 05A.
W73-13239

HELMINTH PARASITES OF FOUR SPECIES OF SUNFISHES (CENTRARCHIDAE) FROM LAKE WILGREEN IN KENTUCKY,
Eastern Kentucky Univ., Richmond. Dept. of Biological Sciences.
J. P. Harley, and T. L. Keefe.
Trans Ky Acad Sci. Vol 32, No 3/4, p 71-74.
Identifiers: Acanthocephala, Centrarchidae, Cestoidea, Digenea, *Helminth, *Kentucky (Lake Wilgreen), Lakes, Lepomis-Cyanellus, Lepomis-Macrochirus, Lepomis-Megalotis, Lepomis-Microlophus, Monogenea, Nematoda, *Parasites, Species, Sunfishes.

Lepomis cyanellus, L. megalotis, L. macrochirus and L. microlophus were examined for parasites. Acanthocephala, Cestoidea, Digenea, Monogenea and Nematoda were represented among the 15 spp. of helminths found parasitizing the fish. All the reported helminths constitute new range extension records.--Copyright 1973, Biological Abstracts, Inc.
W73-13268

EFFECT OF PLANT MOISTURE STRESS ON CARBOHYDRATE AND NITROGEN CONTENT OF BIG SAGEBRUSH,
Utah Univ., Salt Lake City. Dept. of Biology.
S. J. Dina, and L. G. Klikoff.
Journal of Range Management, Vol 26, No 3, p 207-209, May 1973. 2 fig, 1 tab, 25 ref.

Descriptors: *Moisture stress, *Carbohydrates, *Nitrogen, *Sagebrush, *Utah, Consumptive use, Grazing, Range management, On-site investigations, Livestock.
Identifiers: *Red Butte Canyon (Utah).

Plants were selected from Red Butte Canyon, east of Salt Lake City, Utah, to delineate the effects of plant moisture stress on carbohydrate and nitrogen content of important range species. Proper management of grazing intensity on summer ranges, when high plant water stress conditions exist, is needed. Water potential of big sagebrush shows great seasonal variation, ranging from a low of -70.3 bars in September to a high of -8.3 bars in April. Starch content remained fairly consistent in water stressed plants, although sugar content significantly increased in leaves, stem and roots. Leaf nitrogen content significantly decreased in water stressed plants, while stem nitrogen content significantly increased. Overgrazing during summer range conditions, when plant water stress is likely high, could be detrimental since much of the stored nitrogen and carbohydrate would be removed and range quality could therefore be adversely affected. (Bahre-Arizona)
W73-13309

THE PLANT ECOLOGY OF UTAH'S DESERT RANGELANDS,
Utah State Univ., Logan. Dept. of Range Science.
M. M. Caldwell, and N. E. West.
Utah Science, p 14-15, March 1972. 1 fig.

Descriptors: *Ecology, *Invasion, *Succession, *Deserts, *Forage grasses, *Utah, Desert plants, Livestock, Forage palatability, Grasses, Snow cover, Water supply, Distribution patterns, Moisture availability.
Identifiers: Winterfat, Dropseed, Shadscale, Greasewood, Halogeton, Russian thistle.

Utah's desert rangeland comprises 45 percent of the total land area and is an important source of forage for much of Utah's livestock industry, particularly during the winter months. Overgrazing, prior to the 1930's, severely reduced the more palatable plant species such as winterfat and dropseed grasses, while such species as shadscale, greasewood, halogeton and Russian thistle have become increasingly prominent. Snow provides much of the moisture, although it is unevenly distributed by strong winds. Snow surveys indicate that taller desert shrubs such as sagebrush and shadscale act as effective snow traps, while areas covered with lower growing plants are often blown clean of any snow cover. This water supply distribution is one factor in favor of the success of less desirable shrubs. (Bahre-Arizona)
W73-13310

PRAIRIE SANDREED (CALAMOVILFA LONGIFOLIA): WATER INFILTRATION AND USE,
Agricultural Research Service, Sidney, Mont.
J. K. Aase, and J. R. Wight.
Journal of Range Management, Vol 26, No 3, p 212-214, May 1973. 2 fig, 1 tab, 8 ref.

Descriptors: *Soil-water-plant relationships, *Forage grasses, *Consumptive use, *Infiltration rates, Soil water, Growth rates, Environmental effects, Runoff, Grazing, Range management, Soil texture, On-site investigation.
Identifiers: Great plains.

Prairie sandreed grows in nearly pure stands, resulting in distinct boundaries between the sandreed colonies and surrounding vegetation. Because of the distinct growth pattern of the forage species, an investigation of possible differences from the adjacent mixed prairie vegetation, particularly in soil profile and texture and water infiltration and water-use patterns, was conducted. Results of infiltration runs indicated that antecedent soil water in the top 30 cm of soil had no measurable effect on the relative infiltration rates. A comparison of rates on undisturbed prairie sandreed averaged four times higher than on undisturbed surrounding vegetation. When vegetation was clipped to soil surface, soil under prairie sandreed showed a significantly higher intake rate. When top 3 cm of soil was removed, infiltration was greatly reduced on both areas. The greater infiltration rate in prairie sandreed colonies causes vigorous growth. Results demonstrate the important role both living plants and litter play in the water budget of a plant community. Snow catch and water infiltration were increased by increasing plant cover. Determination of optimum grazing intensities should include not only the effects of foliage removal on the growth and survival of plants, but also the maintenance of an adequate plant cover. (Bahre-Arizona)
W73-13312

RESPONSES OF SEMIDESERT GRASSES TO SEASONAL REST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W73-13318

METHODS FOR SEEDING THREE PERENNIAL WHEATGRASSES ON CHEATGRASS RANGES IN SOUTHERN IDAHO,
Agricultural Research Service, Reno, Nev. Plant Science Research Div.
For primary bibliographic entry see Field 04A.
W73-13319

TERRESTRIAL PLANT ECOLOGY.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-13340

DEW: AN ADDITION TO THE HYDROLOGIC BALANCE OF DOUGLAS FIR,
Washington Univ., Seattle. Coll. of Forest Resources.
L. J. Fritschen, and P. Doraiswamy.
Water Resources Research, Vol 9, No 4, p 891-894, August 1973. 1 fig, 1 tab, 5 ref. NSF Grant GB20963.

Descriptors: *Water balance, *Hydrologic budget, *Douglas fir trees, *Dew, Evapotranspiration, Forests, Meteorology.

The hydrologic balance of a 28-meter Douglas fir tree in a weighing lysimeter was determined for 2 clear days in May 1972. Dew accumulations were 6.4 and 10.9 liters, which represent 15% and 20% of the 42.5 and 55.2 liters of evaporation from the tree. In the Pacific Northwest conditions are favorable for dew formation during most of the summer and fall. Thus dew formation could represent a large part of the hydrologic balance of fir forests. (Knapp-USGS)
W73-13366

STUDIES OF LANDSCAPE ECOLOGY OF THE NATURAL PROTECTION AREA 'ENTENFANG' NEAR WESSELING,
G. Bauer.
Decheniana. Vol 123, No 1/2, p 165-198. 1970 (1971). Illus.
Identifiers: Anas-Querquedula, *Landscape ecology, *Biotopes, Charadrius-Dubius, Chettusia-Gregaria, Coturnix-Coturnix, Ixobrychus-Minutus, Podiceps-Ruficollis, Saxicola-Torquata, *Germany (Wesseling).

The 'Entenfang' near Wesseling (West Germany) is located on an old bed of the Rhine. The diversity of the biotope is due to the food-rich waters, its position in a steppe-like open field landscape, the brief changes in water level, the wide areas of flat bank and the extensive reed stands. Nearby meadows and woodlands provide 'Entenfang' with further biotopes with typical plants and animals. The reed zone consists predominantly of the relatively rare Acoretum calami Schulz 40. The Typetum angustifolio-latifoliae (Eggl. 33; Schmale 39) also occurs. The Lemnetum gibbae Mijaw. et J. Tx. 60 occurs occasionally in the small still water bays. The flat banks are covered by the nitrophilous summer annual association of Bedention tripartiti Nordh. 40 and by Ranunculetum scelerati Siss. 46, Tx. 50. Meadows of this area belong to the Arrenatherum type and occur in fresher or drier associations depending on location. This area is rich in birds including 5 Podicipedidae species, 14 Anatidae species, 28 Limnicole species, 5 Laridae species, 3 Sternidae species and 5 Rallidae species. A number of birds rare to the Rhineland occur in this area. Chettusia gregaria was observed once in 1969. Ixobrychus minutus, Saxicola torquata, Podiceps ruficolis, Anas querquedula, Coturnix coturnix and Charadrius dubius are rare breeding birds. Plans for the maintenance and use of the area are presented.--Copyright 1973, Biological Abstracts, Inc.
W73-13388

STRUCTURE AND PROPERTIES OF WATER AND THEIR SIGNIFICANCE FOR BIOLOGICAL SYSTEMS, (IN CZECH),
Ceskoslovenska Akademia Ved, Prague. Inst. of Microbiology.
K. Sigler.
Biol Listy. Vol 37, No 2, p 98-112. 1972. Illus. English summary.
Identifiers: *Biological systems, Chemistry, Organisms, *Water properties, *Water structure.

Water, the universal medium for the overwhelming majority of biological processes, is frequently considered by practicing biologists as an inert solvent which does not significantly affect the processes in biological systems and the properties of which can be disregarded. Recently, evidence was accumulated that, on the contrary, water is one of the most important factors in a number of complicated chemical reactions, making the existence of living matter possible. The data presented represent but a fraction of the experimental material available on water and its properties which accrued from intensive research carried out recently in the field.--Copyright 1973, Biological Abstracts, Inc.
W73-13392

ON THE SIGNIFICANCE OF ANTITRANSPIRANTS FOR TROPICAL CULTIVATED PLANTS, (IN GERMAN),
Giessen Univ. (West Germany). Lehrstuhl Botank (II).
For primary bibliographic entry see Field 02D.
W73-13394

DATA ON THE WATER BALANCE OF SOME XEROTHERMIC TERRESTRIAL LICHENS,
National Museum of Natural History, Budapest (Hungary).
K. Verseghy.
Ann Hist Nat Mus Natl Hung. 63, p 83-97. 1971. Illus.
Identifiers: Cladonia-Convoluta, Cladonia-Furcata, Cladonia-Magyarica, Humidity, *Lichens, Parmelia-Pokornyi, *Xerothermic lichens, *Water balance, *Relative humidity.

The water uptake and release of Cladonia magyarica, C. furcata, C. convoluta and Parmelia pokornyi in water and water vapor at different relative humidities was different in each species. The amount of water uptake was dependent on the structure of the thallus or podetium. The amount of water absorbed or emitted was linearly correlated with the thickness of the upper and lower cortical layers. The entrance of water was inhibited by the gonidia layer and the acid crystals. At 70, 80 and 95% relative humidity, the water content of the lichens increased 12-14%. At 100% relative humidity the water content reached 60-70% in C. furcata, and 45-50% in the remaining species. Under standard conditions a water equilibrium occurred (within 1-2 min for water and several days for water vapor).--Copyright 1973, Biological Abstracts, Inc.
W73-13397

PLANT ACCUMULATIONS OF RADIOACTIVE STRONTIUM WITH SPECIAL REFERENCE TO THE STRONTIUM-CALCIUM RELATIONSHIP AS INFLUENCED BY NITROGEN,
Danish Atomic Energy Commission, Risoe. Research Establishment.
For primary bibliographic entry see Field 05B.
W73-13418

THE IMPORTANCE OF DISCOVERIES IN NEMATOLOGY TO HUMAN WELFARE.

Bioscience. Vol 22, No 4, p 237-239. 1972.
Identifiers: Animals, Human health, *Nematology, *Ecological balance, Parasites.

Nematodes are a widespread and extremely important group of animals. The parasitic forms are important in the health of man and animals and in theefficiency of agriculture. The free-living forms are known to be present in enormous numbers in soil and fresh water, and undoubtedly have major roles in maintaining the natural ecological balance. The role of the marine forms is almost entirely unexplored. Traditionally nematology has been partitioned into functional categories (e.g., animal parasites, plant parasites and free-living terrestrial and aquatic). Now researchers are moving from narrow specialities to broadly based ecological and chemical studies.--Copyright 1973, Biological Abstracts, Inc.
W73-13427

FRESHWATER DIATOMS IN THAILAND,
For primary bibliographic entry see Field 05A.
W73-13570

WATER RESERVE OF LEAVES OF DESERT--STEPPE AND INTRODUCED PLANTS IN THE GOBI DESERT OF MONGOLIA, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
Yu. M. Miroshnichenko.
Ekologiya. Vol 3, No 1, p 37-44. 1972. Illus.
Identifiers: *Desert plants, *Gobi Desert, Leaves, Moisture, *Mongolia, Soil, Steppes, Water storage (Plants).

Information is presented on the water reserve of leaves and daytime dynamics of the water content in leaves of plants of the Gobi desert-steppe zone of Mongolia growing under different soil moisture conditions. The water reserve of leaves was studied in plains habitats, on the talus of the Gobi Altai and in its gorges, in local and introduced species of woody, fruticose and herbaceous plants.--Copyright 1973, Biological Abstracts, Inc.)
W73-13574

STATE OF PLASTID PIGMENTS IN LEAVES OF ESSENTIAL-OIL-BEARING PLANTS UNDER DIFFERENT WATER SUPPLIES, (IN RUSSIAN),
Krymskii Gosudarstvennyi Pedagogicheskii Institut, Simferopol (USSR).
M. V. Sivtsev, G. Ya. Karpova, and G. G. Vasyuta.
Fiziol Biokhim Kul't Rast. Vol 4, No 4, p 390-395. 1972. Illus. (English summary)
Identifiers: *Leaves, Mentha Piperita, Moisture, Pigments, *Plastid pigments, Reproduction, Salvia-Sclarea, Soils, Water supply

The content of water, chlorophyll and carotenoids was determined in leaves of Salvia sclarea L. and Mertha piperita Huds. grown under conditions of constant and variable soil moisture in the reproductive period. The water supply under low soil moisture conditions was unchanged in leaves of S. sclarea, but decreased in M. piperita. Increased pigment formation was observed with low soil moisture, while variations in pigment content were found with variable moisture. A positive correlation was observed between the content of chlorophyll a and essential oil in leaves of the essential-oil-bearing plants.--Copyright 1973, Biological Abstracts, Inc.
W73-13575

COMPLEX CHARACTERISTICS OF THE WATER-HOLDING CAPACITY OF PLANT TISSUES, (IN RUSSIAN),
For primary bibliographic entry see Field 03F.
W73-13576

ANCYROCEPHALUS DYKI N. SP. (MONOGENOIDEA: DACTYLOGYRIDAE) ON THE GILLS OF LEBISTES RETICULATUS,
Vysoka Skola Veterinarni, Brno (Czechoslovakia). Dept. of Parasitology and Invasive Diseases.
Z. Lucky.
Acta Vet. Vol 14, No 1, p 13-18. 1972. Illus.
Identifiers: Ancyrocephalus-Dyki, Dactylogyridae, Gills, *Lebistes-Reticulatus, *Monogenoidea, Species.

A new species of monogenetic fasciolae of the Ancyrocephalus family was ascertained on the gills of aquarium fish (Lebistes reticulatus) from aquariums of breeders from Brno. The marginal hooks of haptor of embryonal type measured 0.0007-0.012 mm, the over-all length of the dorsal central hooks reached 0.020-0.023 mm, the dimensions of their connecting plates 0.004-0.005 x 0.023-0.026 mm. The ventrally central hooks measured 0.018-0.026 mm and their connecting plates, 0.004-0.005 x 0.021-0.026 mm. The copulative organs are represented by a 3-fold spiral twisted copulative tube and indistinct membrane-like supporting organs. The chitin vaginal stiffening is 0.027-0.040 mm long. The monogenetic fasciolae were termed A. dyki.--Copyright 1973, Biological Abstracts, Inc.
W73-13589

ASPINA TRIUM GALLIENI N. SP. (MONOGENA, POLYOPISTHOCOTYLEA) PARASITE OF STRONGYLURA ACUS LACEPEDE 1803, (IN FRENCH),
Montpellier Univ. (France). Laboratoire de Parasitologie Comparee.ocotylea) Parasite of Strongylura Acus Lacepede 1803, (In French),
L. Euzet, and M. H. Ktari.
Bull Soc Zool Fr. Vol 96, No 4, p 509-517. 1971. Illus. English summary.
Identifiers: Aspinatrium-Gallieni, *Monogenea, *Parasites, Polyopisthocotylea, Species, *Strongylura-Acus.

A new species of Microcotylidae (Monogenea) is described (A. gallieni). The parasite lives on the internal side of the gill cover of the Strongylura acus. The ciliated gyrodactyloid larva looks like that of many Microcotylidae. Cysts, one of which clearly contained a metaceracria, were found in the body of this Monogenea.--Copyright 1973, Biological Abstracts, Inc.
W73-13590

THE HIPPOPHAE RHAMNOIDES ALLUVIAL FOREST AT LEINORA, CENTRAL NORWAY: A PHYTOSOCIOLOGICAL AND ECOLOGICAL STUDY,
Bergen Univ. (Norway). Botanical Museum.
A. Skogen.
K Nor Vidensk Selsk Skr. 4, p 1-115. 1972. Illus.
Identifiers: *Alluvial forests, Calcium, Ecological studies, *Forests, Hippophae-Rhamnoides, Light, *Norway, Phytosociological studies, Salinity, Soils, Hydrogen ion concentration.

The biology, distribution and autecology of H. rhamnoides, and the phytosociology and synecology of the extensive Hippophae thickets in the Gaula estuary are treated. Irrespective of the starting point, the vegetation develops into a paraclimax of dense Hippophae scrubs rich in nitrophilous species. After 50-70 yr Hippophae dies, causing disintegration of the community and finally a complete denudation of the banks, after which reestablishment occurs. Light conditions inside the thickets and the N supplied by Hippophae are decisive successional factors. Salinity, pH and Ca content of the soil are of minor importance. The very rich epiphytic flora of Hippophae is described.--Copyright 1973, Biological Abstracts, Inc.
W73-13594

EFFECT OF AWNS AND DROUGHT ON THE SUPPLY OF PHOTOSYNTHATE AND ITS DISTRIBUTION WITHIN WHEAT EARS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 03F.
W73-13595

FIRST DATA ON THE WATER REGIME OF PLANTS FROM SOUTHERN MONGOLIA, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
V. M. Sveshnikova, N. I. Bobrovskaya, and B. Choizhamts.
Bot Zh. Vol 56, No 12, p 1797-1805, 1971. Illus.
Identifiers: *Absorption, Allium-Polyrrhizum, Artemisia-frigida, Brachanthemum-gobidum, Deserts, Eurotia-ceratoides, Haloxylon-ammodendron, *Mongolia, Reaumuria-soongorica, Salsola-passerina, *Steppes plants, Stipa-gobica, Stomata, *Transpiration, Zygophyllum-Xanthoxylon.

The intensity of transpiration, the water content and the amplitude of changes in the water content in leaves, the absorption power of leaves and stomata movement were compared in plants from the steppes (Stipa gobica, Artemisia frigida, Allium polyrrhizum and Eurotia ceratoides) and from desert regions (Reaumuria soongorica, Brachanthemum gobicum, Salsola passerina, Zygophyllum xanthoxylon and Haloxylon ammodendron).--Copyright 1973, Biological Abstracts, Inc.
W73-13607

CHANGES IN SPECIES COMPOSITION OF NITROPHILOUS EDGE ASSOCIATIONS IN STUDENY AND ROHACSKY VALLEYS IN THE LIPTAUER TATRA,
Ceskoslovenska Akademie Ved, Prague. Botanicky Ustav.
K. Kopecky.
Preslia (Praha). Vol 43, No 4, p 344-365, 1971. Illus.
Identifiers: Aegopodium-podagraria, Anthriscus-sylvestris, Armoracia-lapathifolia, Chaerophyllum-aromaticum, *Czechoslovakia (Liptauer Tara), *Nitrophilous edge associations, Rohacsky, Species, Studeny, Valleys.

Nitrophilous edge associations on the banks of the Studeny and Rohacsky brooks (Czechoslovakia) have undergone changes due to changing natural conditions at various elevations and due to the influences of man. Changes in composition are governed by the 1000 m difference in elevation between spring and estuary together with climatic and hydrological changes. The geographic habitat of the subassociations Petasitetum officinalis-glabrati chaerophylletosum aromatici, P. o.g. doronicetosum austriaci and Adenostyli-Athyrietum alpestris petasitetosum albae has not changed significantly with the exception of the shift of the first subassociation to higher elevations. Anthropic influences are noticeable especially in recreation areas and in settled areas. Some allochthonous species (Anthriscus sylvestris, Armoracia lapathifolia and others) appeared which were never identified before in this area. The habitat of other species (Aegopodium podagraria, Chaerophyllum aromaticum and others) shifted to higher elevations beyond their original geographic location.--Copyright 1973, Biological Abstracts, Inc.
W73-13608

AGE AND GROWTH OF THE 'RAINBOW TROUT' (SALMO GAIRDNERII IRIDEUS GIBBONS 1855) LIVING IN THE WATER VALLEY RESERVOIR OF THE HNILEC VALLEY, (IN CZECH),
Slovenske Polnohospodarske Akademie, Bratislava (Czechoslovakia). Laboratorium Rybarstva.
J. Holcik, and R. Zitnan.
Biologia (Bratisl). Vol 27, No 2, p 153-162, 1972. Illus. English summary.
Identifiers: Age, *Czechoslovakia, Growth, Hnilec, *Rainbow trout, Rate, Reservoirs, Salmogairdneri-irideus, Sex, Trout.

The age composition, sex composition and growth of the rainbow trout, S. g. irideus in the Hnilec water valley reservoir (East Slovakia (Czechoslovakia), Tisa river basin) were studied. Differences were found in sex composition in 1966 and 1967, in growth rate in these years and between both sexes and increasing growth rate in comparison with that in 1964. Maximal age found was 6 yr which is considered the boundary age of this species in this locality. The higher age also here is attained by females. The growth rate in the Hnilec reservoir is very high in comparison with North American populations.--Copyright 1973, Biological Abstracts, Inc.
W73-13609

DISTRIBUTION, STRUCTURE AND TROPHIC RELATIONSHIPS OF THE FISH POPULATION OF THE UPPER COURSE OF THE MURESH RIVER, (IN RUMANIAN),
Babes-Bolyai Univ., Cluj (Rumania).
S. Gyurko, and Z. I. Nagy.
Stud Cercet Piscic Inst Cercet Proiect Aliment. No 4, p 311-348, 1971. Illus.
Identifiers: Age, Alburnoides-bipunctatus, Alburnus-alburnus, Ancylus, Barbus-meridionalis-petenyi, Chondrostoma-nasus, Crayfish, Diptera, Distribution patterns, Ephemeroptera, Esox-lucius, Fish food, Gobio-gobio, Gobio-uranoscopus, Larvae, Leuciscus-cephalus, Lota-lota, Neomacheilus-barbatulus, Rivers, Rodents, *Romania Muresh River, Sex, Stenophagous, Structure, Thymallus-thymallus, Trichoptera, Trophic level, Vegetation.

The upper part of the Muresh River between its source and Toplitza (Romania) shows a combination of living conditions and a rich ichthyocenosis with 19 fish spp. having different ecological requirements. The predominant species is the broad snout (Chondrostoma-nasus). The occurrence of various age groups and sex ratios as a result of adaptation to specific living conditions are presented on tables. In the Lota lota population the younger fish (1-3 yr old) predominate, while in the Leuciscus cephalus population the older fish (7-12 yr old) predominate. In the Barbus meridionalis petenyi population younger fish up to 6 yr old predominate. In contrast to populations of other Transylvanian rivers where 4 yr old fish predominate, 5 yr olds of C. nasus predominate in this section of the Muresh. Studies of the food of these fish were made using quantitative methods. Esox lucius eats benthic fish species, almost exclusively. Young eelpouts (L. lota) make up 54.87% of the food of the pike. L. lota eats predominantly benthic fish including its own young (66.75%). A total 30.40% of its food consists of benthic insect larvae and other aquatic invertebrates. The chub population of this river is stenophagous, rather than euryphagous. Its food consists of rodents (40.53%) and river crayfish (29.36%). Vegetation is important in the food of B. m. petenyi, Alburnus alburnus and Alburnoides bipunctatus. Diptera, Ephemeroptera and Trichoptera larvae make up the food of Thymallus thymallus, Gobio gobio, Gobio uranoscopus and Noemacheilus barbatulus. Ancylus is important in the food of G. gobio and G. uranoscopus. Feeding areas of the individual species were determined on the basis of qualitative and quantitative composition of the food. The upper Muresh is so rich in food that food competition between fish is insignificant.--Copyright 1973, Biological Abstracts, Inc.
W73-13610

THE FLORA AND VEGETATION OF POND--BANKS IN THE SOUTHERN PART OF THE ENTRE-SAMBRE-ET-MEUSE,
J. Duvigneaud.
Nat Belg. Vol 53, No 1, p 2-18, 1972. Illus.
Identifiers: Banks, *Belgium (Moulin pond), Calcium, Carbonates, Conductivity, Entre-Sambre-Et-Meuse, *Flora, Ponds, Substratum, *Vegetation.

Moulin pond, situated SW of Rance, Belgium, has moderately high water mineral content, is basic with a clear predominance of Ca++ and HCO3 ions, has good conductivity, and is of medium biogenic capacity. Fourchine pond, near Villers-La-Tour and Seloignes, Belgium, has low mineral content, slightly acid or neutral water, is of weak biogenic capacity and low conductivity. Each has its own distinctive vegetation which is determined partly by the geological substratum.--Copyright 1973, Biological Abstracts, Inc.
W73-13615

CONTRIBUTION TO THE KNOWLEDGE OF SCIRPETUM SILVATICI IN CZECHOSLOVAKIA (WESTERN PART),
Ceskoslovenska Akademie Ved, Prague. Botanicky Ustav.
Z. Neuhauslova-Novotna, and R. Neuhasl.
Preslia (Praha). Vol 44, No 2, p 165-177, 1972. Illus.
Identifiers: Agrostis-canina, Cardamine-amara, Carex-spp, *Czechoslovakia, Glyceria-fluitans, Juncus-filiformis, Moisture, Ranunculus-flammula, *Scirpetum-silvatici, Scirpus-sylvaticus, Soils, Viola-palustris.

Scirpetum silvatici (alliance Calthion) is a meadow association which grows on creek banks and areas with waterlogged soil. In western Czechoslovakia it is a replacement association in damp to wet Alnion glutinoso-incane forests and comes in contact with various associations of inland areas. The soils of this association are severely influenced by a more or less mobile ground water which lies in the upper levels of the soil throughout the year. Scirpus silvaticus is the predominant species. The subassociation caricetosum with numerous differential species (including Carex species Ranunculus flammula, Viola palustris, Juncus filiformis and Agrostis canina) is the most frequent form of the Scirpetum silvatici. It grows on moorish soils

and wet gley with stagnant water. The subassociation typicum has no differential species. In the area investigated it is represented by a Glyceria fluitans formation with a tendency toward paludal associations (differential species G. fluitans and Cardamine amara). In Czechoslovakia, this association is most frequent in hercynian areas. It is rare in the western Czechoslovakian pannonian.--Copyright 1973, Biological Abstracts, Inc.
W73-13616

ON THE HELMINTH FAUNA OF FISHES IN THE SMALL DANUBE (IN CZECH),
Slovenska Akademie Vied, Kosice (Czechoslovakia). Helmintologicky Ustav.
R. Zitnan.
Helminthologia (Bratisl). 10, p 313-320, 1969 (1971), English summary.
Identifiers: Acanthocephala, Cestoidea, *Czechoslovakia (Danube River), *Fauna, Fishes, *Helminth, Hirudinea, Monogeneoidea, Nematoda, Piscivorous, Trematoda.

Fishes (40) belonging to 13 species coming from the Small Danube near Jahodna, Czechoslovakia were examined in May 1963. The following helminth species were found: 23 Monogeneoidea, 8 Cestoidea, 6 Trematoda, 4 Nematoda, 3 Acanthocephala and 2 Hirudinea. The majority of helminth species (34) was parasites in 1 host species only but Metagonimus yokogawai occurred in 10, Diplostomum spathaceum in 9 and Posthodiplostomum cuticola in 5 fish species. The largest number of helminth species was found parasitizing Leuciscus cephalus (12) and Alburnus alburnus (12), less in Abramis brama danubii; (10), L. idus (9), Blicca bjoerkna (9) and Esox lucius (8). From the epizootological point of view Dactylogyrus extensus, D. vastator, Tetraonchus monenteron, Gyrodactylus katharneri and G. medius and the larval stages of Diplostomum spathaceum are important. Posthodiplostomum cuticola and Ligula intestinalis whose definite hosts are piscivorous birds are of importance both in all fish-breeding farms of the Danube lowland and the planned dams of that region. Special attention from the epidemiological and epizootological standpoint should be devoted to the larval stages of M. yokogawai. The latter was found in 10 fish species, and they can infest not only men but also some domestic (pigs, cats and dogs) and fur animals.--Copyright 1973, Biological Abstracts, Inc.
W73-13626

CONTRIBUTION TO THE STUDY OF THE CONDENSATION OF ORGANIC COMPOUNDS DURING HUMUS FORMATION IN A PODZOLIC ENVIRONMENT (IN FRENCH),
Ecole Nationale Superieure Agronomique de Nancy (France).
S. Bruckert, and F. Jacquin.
Bull Ec Natl Super Agron Nancy, Vol 13, No 1/2, p 28-35, 1971, Illus, English summary.
Identifiers: Calluna-vulgaris, *Condensation, Environment, Formation, *Humus, *Organic compounds, Pinus-sylvestris, *Podzolic environment, Polymeric compounds, Rainfall.

Rainfall water of Pinus sylvestris and Calluna vulgaris foliage contain organic compounds the molecular weight of which can reach 700. Polymerization processes increase in the mor humus and then in the Bh horizon. Eighty percent of humic polymeric compounds of the spodic horizon have a molecular weight below 6000.--Copyright 1973, Biological Abstracts, Inc.
W73-13627

PHYTOSOCIOLOGICAL STUDY OF THE MANGROVES OF THE TULEAR REGION (MADAGASCAR): I. THE MANGROVE TREES OF SARODRANO AND TULEAR (IN FRENCH),
Aix-Marseille Univ., Marseille (France). Laboratoire de Phytosociologie Cartographique.
H. Weiss.
Tethys Suppl, 3 p 297-319, 1972, Illus, English summary.
Identifiers: Avicennia-officinalis, Bruguiera-gymnorrhiza, Ceriops-boviniana, Euphorbs, *Madagascar, *Mangroves, Monocots, Physicochemical studies, *Phytosociological studies, Rhizophora-mucronata, Soils, Sonneratia-alba, Topography, Trees.

Mangrove distribution in 2 estuary-type mangrove swamps of Tulear region is described, corresponding maps are presented and the phytosociological structure is explained according to the influence of topographic, pedologic, physicochemical and historic features. Important plant species found were Avicennia officinalis, Sonneratia alba, Bruguiera gymnorrhiza, Ceriops boviniana, Rhizophora mucronata, euphorbs and marine monocots.--Copyright 1973, Biological Abstracts, Inc.
W73-13632

WATER AND PHOTOSYNTHESIS RELATIONS OF DESERT PLANTS IN THE MAURITANIAN SAHARA: III. SMALL SHRUBS: HEMICRYPTOPHYTES AND GRASSES (IN GERMAN),
O. Stocker
Flora (Jena), Vol 161, No 1/2, p 46-110, 1972, Illus, English summary.
Identifiers: Abutilon-muticum, Africa, Aristida-pungens, Cassia-aschrek, Chrozophora-brocchiana, Citrullus-colocynthis, Corchorus-antichorus, Cucumis-melo, Deserts, Evolution, Grasses, Leaf, *Mauritanian Sahara, Morphology, *Photosynthesis, Primary production, Shrubs, Sporobolus-spigatus, Transpiration, Zygophyllum-waterloti, *Hemicryptophytes, *Desert plants.

Among the chamaephytes are trodden Cassia aschrek, with soft, pinnate leaves, Abutilon muticum, with soft, big, simple leaves, Chrozophora brocchiana, with smaller, slightly succulent leaves, Corchorus antichorus, prostrate with small leaves, and the succulent-leaved Zygophyllum waterlotii. They remain active in the dry period, with water turnover and photosynthetic production which, in Cassia and Corchorus, still surpass the records of the trees. Less adapted to the desert life is Abutilon with big and soft leaves. The hemicryptophytic turnip-rooted Citrullus colocynthis and Cucumis melo belong to a special type, which protects the juicy leaves from the heat-death by a strong transpiration. The dune-grasses Aristida pungens and Sporobolus spicatus are characterized by the minute regulation of the water-balance, characteristic of the grass-type. Aristida pungens possesses rolling-up leaves of highest perfection, and is able to maintain a positive photosynthesis on the base of a low but very economical transpiration, even during extreme dry periods. The different physiognomy of the Northern and Southern Sahara, Africa, i.e., diffuse bush- and contracted tree-desert, is the consequence of the different genetical and constitutional substance, which the northward and southward adjoining steppe and savanna vegetations had to offer for the evolution of the desert vegetation. (See also W72-00726).--Copyright 1973, Biological Abstracts, Inc.
W73-13633

2J. Erosion and Sedimentation

ENGINEERING HYDROLOGY,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 03B.
W73-13016

A STUDY OF SEDIMENT TRANSPORT IN NORWEGIAN GLACIAL RIVERS, 1969,
Norsk Institutt for Vannforskning, Blindern.
G. Ostrem, T. Ziegler, and S. R. Ekman.
Alaska University Institute of Water Resources Fairbanks Publication No IWR-35, February 1973. 59 p, 29 fig, 20 ref. (Translated from Norway Institute of Water Resources Department of Hydrology Report 6/70, September 1970) OWRR A-042-ALAS(1).

Descriptors: *Sediment transport, *Glacial sediments, *Melt water, *Glaciers, Movement, Scour, Temperature, Rainfall, Summer, Data collections, Gaging stations, Streamflow, Sediment yield.
Identifiers: *Norway, *Glacial rivers.

The studies of transport of solid particles in Norwegian glacial rivers have a double purpose. First, the studies are useful for those who wish to exploit the water, either for the drinking purposes or for the production of electric power. Second, the studies have a scientific value, as the glaciers over a longer period have a great landscaping effect. Geographers and geomorphologists have always wished to obtain knowledge of the eroding velocity of glaciers. In this respect, studies of sediment transport in glacial rivers may furnish valuable information. The observation stations were placed as close as possible to the glacial front, at a point where the melt water is contained in one channel. The highest sediment concentration of the 1969 summer observation period was 3,037 mg/liter, measured on July 30, while the lowest concentration, 11 mg/liter, was measured August 25. The first high sediment concentrations and large daily transports for the observation period are associated with high daily mean temperatures, glacier ablation, and discharge from the glacier between June 17 and 27. The large transport during this period was mainly caused by erosion of sediment by the glacier. (Woodard-USGS)
W73-13026

REGIME, THEORY, AND METHODS OF CALCULATION AND MEASUREMENT OF SEDIMENTS AND WASTE WATERS (REZHIM, TEORIYA, METODY RASCHETA I IZMERENIYA NANOSOV I STOCHNYKH VOD).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, A. V. Karaushev, and I. V. Bogolyubova, editors, Leningrad, 1972. 220 p.

Descriptors: *Sediments, *Sediment discharge, *Sediment yield, *Sediment transport, *Waste water (Pollution), Water pollution, Self-purification, Streams, Channels, Reservoirs, Discharge (Water), Sediment load, Suspended solids, Particle size, Particle shape, Settling velocity, Turbidity, Erosion, Statistical methods, Computers.
Identifiers: USSR, *European USSR, Competence (Streams).

Problems of sediment movement in streams and sediment measurement are discussed in this publication, the ninth in a series entitled 'Regime, Theory, and Methods of Calculation and Measurement of Sediments and Waste Waters,' prepared by workers of the sediment laboratory of Leningrad State Hydrologic Institute. Improved methods are presented for computing sediment transport in lowland and mountain streams and waste water dilution in rivers, and an optical method for measurement of turbidity in reservoirs is described. Investigations are made of suspended-load and bed-load discharges, size composition of bottom sediments, and settling velocity of natural sediment grains. Recommendations are given for computing sediment yield of ungaged rivers in European Russia. (See W73-13046 thru W73-13054) (Josefson-USGS)
W73-13045

SEDIMENT YIELD OF STREAMS IN EUROPEAN RUSSIA (STOK NANOSOV REK YEVROPEYSKOY TERRITORII SSSR),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. N. Lisitsyna, and V. I. Aleksandrova.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 23-52, Leningrad, 1972. 4 fig, 7 tab, 23 ref.

Descriptors: *Sediment yield, *Sediment discharge, *Streams, Watersheds (Basins), Erosion, Geomorphology, Meteorology, Discharge (Water), Turbidity, Particle size, Suspended solids, Correlation analysis, Regression analysis, Variability, Equations, Curves, Maps.
Identifiers: *European USSR.

Division of European Russia into 9 erosion zones was based on observations of sediment yield at 206 stations in the area, excluding the Causcasus. Principal factors used to measure sediment yield were water discharge, channel slope, average basin elevation, density of the drainage network, and lake-surface and waterlogged areas of the river basin. Regression equations obtained by multiple linear correlation were used to calculate average annual sediment yield and average annual turbidity of streams. Variability and seasonal distribution of annual sediment yield are examined, and a map shows the particle-size distribution of suspended solids. Sediment yield of large rivers in the White, Barents, Baltic, Black, Azov, and Caspian Sea basins is tabulated. (See also W73-13045) (Josefson-USGS)
W73-13046

RELATION OF AVERAGE LONG-TERM SUSPENDED-SEDIMENT YIELD OF STREAMS IN EUROPEAN RUSSIA TO PHYSIOGRAPHIC FACTORS (ZAVISIMOST' SREDNEGO MNOGOLETNEGO STOKA VZVESHENNYKH NANOSOV REK YEVROPEYSKOY TERRITORII SSSR OT FIZIKO-GEOGRAFICHESKIKH FAKTOROV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
N. N. Bobrovitskaya.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 68-84, Leningrad, 1972. 3 fig, 3 tab, 34 ref.

Descriptors: *Sediment yield, *Sediment discharge, *Suspended solids, *Streams, *Geomorphology, Topography, Erosion, Watersheds (Basins), Discharge (Water), Correlation analysis, Regression analysis, Equations.
Identifiers: *European USSR.

Relation of average long-term suspended-sediment yield of streams to physiographic conditions in lowland regions of European Russia is analyzed. Six large erosion zones are identified on the basis of geomorphological delineation of the area and consideration of climatic factors. Analysis of suspended-sediment yield within zones is based on multiple correlation methods and consideration of differences in stream gradients and forested and plowed areas. Basic factors determining suspended-sediment discharge into streams are water discharge and geomorphological features of the region. (See also W73-13045) (Josefson-USGS)
W73-13047

CALCULATION OF SUSPENDED-SEDIMENT TRANSPORT BY MOUNTAIN STREAMS (K VOPROSU O RASCHETE TRANSPORTA VZVESHENNYKH NANOSOV GORNYMI REKAMI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
I. V. Bogolyubova.
In: Razhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 85-99, Leningrad, 1972. 2 fig, 5 tab, 8 ref.

Descriptors: *Sediment transport, *Suspended solids, *Streams, *Mountains, Bottom sediments, Coarse sediments, Particle size, Turbidity, Curves, Equations.
Identifiers: USSR, Competence (Streams).

A method was proposed for applying the equation of sediment-saturated flow developed by A. V. Karaushev to calculation of the transporting capacity of mountain streams. The Karaushev method of calculating suspended-sediment transport can be used for mountain streams, where coarse sediments comprise a large percentage of bottom sediments and can substantially reduce stream capacity to transport suspended solids. (See also W73-13045) (Josefson-USGS)
W73-13048

EXPERIMENT IN DETERMINING TOTAL SEDIMENT DISCHARGE (SUSPENDED LOAD AND BED LOAD) (OPYT VYCHISLENIYA POLNOGO RASKHODA NANOSOV (VZVESHENNYKH I VLEKOMYKH)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. V. Razumikhina.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 100-110, Leningrad, 1972. 3 fig, 5 tab, 13 ref.

Descriptors: *Sediment discharge, *Suspended load, *Bed load, *Sediments, *Sediment transport, Bottom sediments, Suspended solids, Dunes, Particle size, Discharge (Water), Turbidity, Equations.
Identifiers: *European USSR, *Polomet' River.

Determination of bed-load discharges was based on dune movement of sediments in the Polomet' River at Yazhelbitsy. A ratio was obtained between bed-load and suspended-load discharges, and a determination was made of total sediment discharge. Recommendations are given for determining total sediment discharge on the basis of data on suspended-sediment discharges, dune movement of sediments, and particle-size composition of suspended and bottom sediments. (See also W73-13045) (Josefson-USGS)
W73-13049

EXPERIMENTAL INVESTIGATION OF SETTLING VELOCITY OF SEDIMENTS (EKSPERIMENTAL'NOYE ISSLEDOVANIYE GIDRAVLICHESKOY KRUPNOSTI NANOSOV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. V. Romanovskiy.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 111-136, Leningrad, 1972. 3 fig, 9 tab, 13 ref.

Descriptors: *Laboratory tests, *Settling velocity, *Sediments, *Sediment transport, Particle shape, Particle size, Stokes law, Viscosity, Suspension, Deposition (Sediments), Laminar flow, Turbulent flow, Reynolds number, Water temperature, Instrumentation, Measurement, Curves, Equations.
Identifiers: USSR.

Tests were conducted at the sediment laboratory of the Leningrad State Hydrologic Institute to study settling velocity of natural sediment grains and influence of grain shape on their settling rate. Settling velocity was measured for grains with a diameter ranging from 0.0004 cm to 7.5 cm. The relation of settling velocity to grain diameter and shape is graphed, and analytical expressions of settling velocity are presented for laminar and turbulent flow. (See also W73-13045) (Josefson-USGS)
W73-13050

VARIATIONS IN GRAIN SIZE OF BOTTOM SEDIMENTS IN LOWLAND AND MOUNTAIN STREAMS (IZMENCHIVOST' KRUPNOSTI DONNYKH OTLOZHENIY RAVNINNYKH I GORNYKH REK),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. A. Petukhova.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 137-158, Leningrad, 1972. 8 tab, 25 ref.

Descriptors: *Bottom sediments, *Particle size, Streams, *Variability, *Sediment transport, Sampling, Statistical methods, Sediment sorting, Photography, Equations.
Identifiers: USSR, *Baksan River basin (USSR), *Don River (USSR).

Investigations were carried out in 1968-69 by the sediment laboratory of the Leningrad State Hydrologic Insitute to study size composition of bottom sediments in mountain streams of the Baksan River basin and in the Don River at Nikolayevskaya Station. Variations in grain size of bottom sediments depend on morphometric characteristics of the river reach and, presumably, on the direction of erosion-aggradational processes. The number of samples needed for reliable size analysis is derived statistically, and a recommendation is made for studying size composition of bottom sediments in mountain streams at low stages during free channel access. (See also W73-13045) (Josefson-USGS)
W73-13051

STUDY OF SUSPENDED SEDIMENTS IN RESERVOIRS BY THE METHOD OF SPECTRAL DIFFUSIVITY (IZUCHENIYE VZVESHENNYKH NANOSOV V VODOKHRANILISHCHAKH METODOM SPEKTRAL'NOY YARKOSTI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. G. Kal'ko.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 159-171, Leningrad, 1972. 5 fig, 4 tab, 12 ref.

Descriptors: *Sediments, *Suspended solids, *Reservoirs, *Analytical techniques, Optical properties, Reflectance, Light, Turbidity, Particle size, Humus, Instrumentation, Measurement, Curves, Equations.
Identifiers: USSR, *Spectral diffusivity.

Application of the method of spectral diffusivity to study of fine-grained suspended sediments was based on investigations carried out at the Kayrakkum, Dubossary, and Minchegaur Reservoirs and on the Polomet' River in 1966-68. Changes in the curve of spectral diffusivity coefficients are associated with turbidity, suspended-sediment size, presence of humus substances, and reflectance of suspended material. The method is promising for studying turbidity in surface layers of water bodies and will be useful in studying plan structure of flows in reservoirs and lakes provided the water masses transported by flows differ in their optical properties. (See also W73-13045) (Josefson-USGS)
W73-13052

USE OF COMPUTERS TO COMPUTE UNSTEADY WIND CURRENTS IN BODIES OF WATER AS ILLUSTRATED BY LAKE BAYKAL (PRIMENENIYE EVM DLYA RASCHETA NEUSTANOVIVSHIKHSYA VETROVYKH

TECHENIY V VODOYEMAKH (NA PRIMERE OZ. BAYKAL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02H.
W73-13053

AN IMPROVED QUICK-FIELD METHOD OF CALCULATING WASTE WATER DILUTION IN RIVERS (USOVERSHENSTVOVANIYE EKSPRESS-METODA RASCHETA RAZBAVLENIYA STOCHNYKH VOD V REKAKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W73-13054

POSTDEPOSITIONAL OSMOTIC ADJUSTMENTS IN SEDIMENTS FROM SOAP LAKE, WASHINGTON,
Duke Univ., Durham, N.C. Dept. of Zoology.
M. A. Mantuani.
Limnology and Oceanography, Vol 18, No 3, p 403-413, May 1973. 6 fig, 17 ref.

Descriptors: *Pore water, *Bottom sediments, *Salinity, *Osmosis, Connate water, Mass transfer, Diffusion, Alkalinity, Chemical potential, Ion exchange, Clay minerals, Diagenesis, Water chemistry, *Washington.
Identifiers: *Soap Lake (Wash).

Sediments from Soap Lake, an alkaline saline lake on the arid Columbia Plateau, demonstrate postdepositional changes in response to a measured osmotic potential gradient through the sediment. The primary mechanism for osmotic readjustment is redistribution of water and dissolved ions through the sediment, altering sediment water content and pore water salinity. This redistribution provides a mechanism for mobilizing ions from exchange sites and from minerals to form pore waters of altered composition. (Knapp-USGS)
W73-13064

ENZYMATIC NH3-N DETERMINATION: A SPECIFIC METHOD FOR THE DETERMINATION OF AMMONIA IN WATER AND SEDIMENTS,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 05A.
W73-13068

FOSSIL PIGMENTS IN THE SURFACE SEDIMENTS OF A MEROMICTIC LAKE,
Minnesota Univ., Minneapolis. Dept. of Botany.
For primary bibliographic entry see Field 05B.
W73-13099

BRIEF FIELD GUIDE TO INTERTIDAL SEDIMENTS, MINAS BASIN, NOVA SCOTIA,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-13204

RECONNAISSANCE SURVEY OF HOG ISLAND, PRINCE EDWARD ISLAND,
McMaster Univ., Hamilton (Ontario).
S. B. McCann.
Maritime Sediments, Vol 8, No 3, p 107-113, December 1972. 9 fig, 1 tab, 6 ref.

Descriptors: *Waves (Water), *Ocean waves, Beach erosion, Winds, Surf, Refraction (Water waves), Fetch.
Identifiers: *Gulf of St. Lawrence.

Hog Island, on the north coast of Prince Edward Island, is a 10-mile long barrier island which separates Malpeque Bay from the open waters of the Gulf of St. Lawrence. The island exhibits all the characteristic features of the sand beach and dune barriers of Prince Edward Island and, being relatively inaccessible, is in a fairly natural state. Basically it consists of a series of vegetated dune ridges, with associated marsh areas at the rear, the continuity of the main dune ridges being broken by two large washover fans. The end of the island has undergone considerable changes since 1935, the main trend being an extension of the shoreline for 600 ft in a southeast direction. There has been an associated 200-ft extension of the dune area in this direction, but this has been accompanied by a marked retreat of the seaward dunes. Size frequency curves for the beach foreshore, breaker zone, trough (closest to the offshore bar), offshore bar, dune and two lagoon samples were plotted on arithmetic probability paper. All the samples illustrated have one dominant component (saltation population) but differ in the presence or absence of secondary components (traction or suspension populations). (Knapp-USGS)
W73-13205

BARRIER ISLANDS, SAND SPITS AND DUNES IN THE SOUTHERN GULF OF ST. LAWRENCE,
McMaster Univ., Hamilton (Ontario).
S. B. McCann, and E. A. Bryant.
Maritime Sediments, Vol 8, No 3, p 104-106, December 1972. 13 ref.

Descriptors: *Beaches, *Sand bars, *Sand spits, *Dunes, Canada, Waves (Water), Littoral drift, Sedimentation, Beach erosion.
Identifiers: *Gulf of St. Lawrence, *Prince Edward Island.

Many miles of the northern coast of Prince Edward Island and the eastern coast of New Brunswick consist of long sand beaches fronting narrow barrier islands or sand spits, some of which have well developed dunes. The present barrier island systems probably originated at the lower sea levels of the Holocene as coastal beaches and spits which were able to build up significant dunes and beach deposits. As sea level rose the land behind these dunes was flooded forming lagoons. The beaches and dunes then underwent shoreward retreat as sea level continued to rise. The barrier islands thus represent a dynamic equilibrium between the slope of the land, the rise of sea level, and the intensity of wave attack. Over the past 150 years the Kouchibougauc barriers show evidence of frequent breaching of the islands and infilling of inlet systems that is a response to the wave refraction patterns of storm waves and the subsequent redistribution of sediment along the coastline. Not only are the barrier islands changing shape they are also being pushed shorewards as evidenced by accurate charts since 1839 and good aerial photographs since 1930. (Knapp-USGS)
W73-13206

IN SITU ACTIVATION ANALYSIS OF MARINE SEDIMENTS WITH CALIFORNIUM-252,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 02K.
W73-13295

SUSPENDED-SEDIMENT YIELD FROM THE ABRAMOV GLACIER BASIN (STOK VZVESHENNYKH NANOSOV S BASSEYNA LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W73-13355

REGULAR MEANDER PATH MODELS,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W73-13370

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX G--FLUVIAL SEDIMENT.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 06B.
W73-13487

NEAR-SHORE RIPPLES: SOME HYDRAULIC RELATIONSHIPS,
Windsor Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 08B.
W73-13530

A SEDIMENT SQUEEZER FOR REMOVAL OF PORE WATERS WITHOUT AIR CONTACT,
California Univ., Los Angeles. Dept. of Geology.
E. K. Kalil, and M. Goldhaber.
Journal of Sedimentary Petrology, Vol 43, No 2, p 553-557, June 1973. 4 fig, 11 ref. AEC Grant AT (04-3)-34 P.A. 134.

Descriptors: *Pore water, *Connate water, *Sediments, *Sampling, *Sedimentology, *Equipment, *Laboratory equipment.
Identifiers: *Pore water squeezer.

A low-pressure mechanical squeezer was designed for removing interstitial water from ocean sediments with only minimal or no air contact. The plastic liner in which the sediment was collected serves as the squeezing chamber, reducing oxidation of sulfides and gas exchange of CO2. Pore water is collected from both ends of a 10-cm section of core, increasing squeezing efficiency. The system is easily thermoregulated to operate at bottom temperatures. As this squeezer is inexpensive and easy to build, several units may be operated at once. (Knapp-USGS)
W73-13531

A VIBRATORY CORING SYSTEM FOR CONTINENTAL MARGIN SEDIMENTS,
Rhode Island Univ. Kingston. Graduate School of Oceanography.
R. L. McMaster, and C. E. McClennen.
Journal of Sedimentary Petrology, Vol 43, No 2, p 550-552, June 1973. 1 fig, 5 ref. ONR Contract N00014-68-A-0215-0003.

Descriptors: *Sampling, *Cores, *Core drilling, *Continental shelf, *Bottom sediments, Equipment, Sedimentology.
Identifiers: *Core drill (Vibratory).

A vibratory coring system was developed to sample sands on continental margins for more detailed data concerning sedimentary processes. It consists of three vibration mechanisms with attached 2 m coring tubes, a battery powered energy source, and a locking compass for orientation. Coring units, 2 m apart, are located at the apices of a triangular platform. Field tests indicate that the system is operational at all depths on the continental shelf. (Knapp-USGS)
W73-13532

AN ELUTRIATOR METHOD FOR PARTICLE-SIZE ANALYSIS WITH QUANTITATIVE SILT FRACTIONATION,
Illinois State Geological Survey, Urbana.
L. R. Follmer, and A. H. Beavers.
Journal of Sedimentary Petrology, Vol 43, No 2, p 544-549, June 1973. 1 fig, 2 tab, 5 ref.

Descriptors: *Silts, *Particle size, *Analytical techniques, *Settling velocity, Sampling, Equipment, Sedimentology.
Identifiers: *Elutriation.

An elutriator was developed to increase laboratory efficiency in particle-size and mineralogical analyses of silt. The elutriator, described quantitatively, separates silts into three predetermined size fractions, which are clean and suitable for mineralogical analysis. To complete the particle-size analysis, sand fractions are determined by sieving and clay fractions are determined by the pipette method. (Knapp-USGS)
W73-13533

COMPARISON BETWEEN COMPRESSIBILITIES OF SANDS AND CLAYS,
University of Southern California, Los Angeles. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 02G.
W73-13534

A SPLITTER FOR UNCONSOLIDATED CORES TAKEN IN PLASTIC LINERS,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
T. W. Durden, and H. Frohlich.
Journal of Sedimentary Petrology, Vol 43, No 2, p 521-524, June 1973. 2 fig, 2 ref. ONR N0014-67-A-0201-0013 NSF GA-15226 and GA 25016.

Descriptors: *Sampling, *Cores, *Equipment, Sedimentology, Sediments, Analytical techniques, Laboratory equipment.
Identifiers: *Core splitter.

An inexpensive machine was developed to split (longitudinally) cores of uncolsolidated sediments without extruding them from the plastic tubing in which they were collected. This machine has four main advantages: (1) minimal amount of core disturbance, (2) speed and simplicity of operation, (3) accommodation of cores of various lengths and diameters, and (4) portability. The method of operation begins by mechanically pushing a core in its linear, laid in a V-shaped trough, through a set of gas burners which are diametrically opposed in a plane vertical to the trough. This step slightly heats the plastic liner along a thin line on opposite sides of the liner. Immediately following the burners is 0.045-inch diameter piano wire strung in the same plane as the burners. After the liner emerges from the burners the soft plastic is easily cut by the piano wire and the core and liner are sliced into equal halves. (Knapp-USGS)
W73-13535

SIEVE LOAD EQUATIONS AND ESTIMATES OF SAMPLE SIZE,
California State Univ., Sacramento. Dept. of Geology.
N. C. Janke.
Journal of Sedimentary Petrology, Vol 43, No 2, p 518-520, June 1973. 4 ref.

Descriptors: *Sedimentology, *Sieve analysis, Equations, Sampling, Particle size, Particle shape.
Identifiers: *Sieve loads.

A semi-empirical expression for sieve loads is given in terms of the sieve aperture in mm and the phi interval between sieves. The acceptable load on a 1.00-mm sieve, whether it is used or not, is given in terms of weight density, a shape factor, long and short particle intercepts, the number of finer near-mesh particles, and a parameter that varies with the internal diameter of the sieve. Equations for sieve loads can also be an aid in estimating sample size. (Knapp-USGS)
W73-13536

THE SIGNIFICANCE OF THE SOLUTION OF FELDSPAR IN POROSITY DEVELOPMENT,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
M. T. Heald, and R. E. Larese.
Journal of Sedimentary Petrology, Vol 43, No 2, p 458-460, June 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Porosity, *Pores, *Mineralogy, *Weathering, *Diagenesis, Groundwater movement, Groundwater.
Identifiers: *Feldspars.

Post-depositional solution of feldspar is an important process in porosity development in some formations. Solution is very selective and may result in considerable reduction in the amount of feldspar and significant change in proportion of feldspar types. (Knapp-USGS)
W73-13537

THE ORIGIN AND SIGNIFICANCE OF SOME DOWNCURRENT-DIPPING CROSS--STRATIFIED SETS,
Keele Univ. (England). Dept. of Geology.
N. L. Banks.
Journal of Sedimentary Petrology, Vol 43, No 2, p 423-427, June 1973. 6 fig, 11 ref.

Descriptors: *Sedimentary structures, *Stratification, *Ripple marks, Alluvial channels, Bed load, Sand waves, Dunes.
Identifiers: *Norway.

Downcurrent dipping sets of cross stratification occur in late Precambrian fluvial sandstones in northern Norway. The sets form cosets up to 4 m thick. The sets are wedge shaped or lens shaped, dip at less than 8 deg relative to the horizontal, and have erosive boundaries. The geometry of the sets suggests that they were formed by the migration of large scale ripples over a bed which was wavy on a scale larger than that of the ripples. This wavy bedform was also moving downcurrent but at a slower rate than the ripples. It is estimated that the downstream faces of the wavy bedforms dipped at less than 11.5 deg and that the ripples moved at least 3.2 times as fast as the waves. The waves may be comparable with either the major midchannel waves or the side bars of some modern streams. (Knapp-USGS)
W73-13538

OSTLER LENSES: POSSIBLE ENVIRONMENTAL INDICATORS IN FLUVIAL GRAVELS AND CONGLOMERATES,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
I. P. Martini, and J. Ostler.
Journal of Sedimentary Petrology, Vol 43, No 2, p 418-422, June 1973. 8 fig, 1 tab, 7 ref.

Descriptors: *Sedimentary structures, *Bed load, *Sediment transport, Sand bars, Braiding, Turbulent flow, Alluvial channels, Gravels.
Identifiers: Ostler lenses.

The Ostler lens is a sedimentary structure observed in recent and ancient coarse gravelly sequences. In recent environments they are small dunes, mounds, or small transverse bars made up of rounded, sorted small pebbles. They are found in streams carrying predominantly coarse gravel to fine pebble materials, usually in shallow reaches at the downstream end of braid islands, bars, and point bars. Ostler lenses record essentially unidirectional to slightly convergent flow and turbulent lower flow regime conditions for the riffle (shallower) parts of alluvial channels. (Knapp-USGS)
W73-13539

HEAVY MINERAL CONCENTRATING PROCESSES AND DENSITY/SHAPE/SIZE EQUILIBRIA IN THE MARINE AND COASTAL DUNE SANDS OF THE APALACHICOLA, FLORIDA, REGION,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-13540

HEAVY MINERALS OF HORN ISLAND, NORTHERN GULF OF MEXICO,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
W. E. Harrison.
Journal of Sedimentary Petrology, Vol 43, No 2, p 391-395, June 1973. 3 fig, 2 tab, 7 ref.

Descriptors: *Mineralogy, *Provenance, *Sand bars, *Gulf of Mexico, *Mississippi, Metamorphic rocks, Sediment transport, Rivers, Littoral drift.
Identifiers: *Heavy minerals.

The heavy mineral assemblage of Horn Island, a barrier island in the northern Gulf of Mexico 8-10 miles off Mississippi, is diagnostic of a metamorphic source area. The crystalline metamorphic region in east-central Georgia which is drained by the South Alabama and Apalachicola Rivers and their respective tributaries is suggested as the ultimate source area for the heavy minerals. (Knapp-USGS)
W73-13541

OCEANIC SEDIMENTS AND THEIR DIAGENESIS: SOME EXAMPLES FROM DEEP-SEA DRILLING,
Scripps Inst. of Oceanography, La Jolla, Calif. Deep Sea Drilling Project.
T. A. Davies, and P. R. Supko.
Journal of Sedimentary Petrology, Vol 43, No 2, p 381-390, June 1973. 13 fig, 30 ref.

Descriptors: *Bottom sediments, *Oceans, *Sampling, *Stratigraphy, *Diagenesis, Cores, Mineralogy, Sedimentary rocks, Geochemistry.

Cores collected by drilling in the deep ocean provide samples of deeply buried ocean sediments in the process of becoming sedimentary rocks. Carbonate sediments have been dominant in deep-sea sediments since at least the Jurassic, except during the Eocene when siliceous sediments became dominant. The sonic velocity is consistently lower than the velocity determined from refraction measurements. A sequence of diagenetic changes progresses from breakup of individual coccoliths to solution and recementation. Dolomite rhombs are related to either igneous activity, to evaporitic conditions prevailing in the past, or to geochemical control in a reducing environment. Chert, both nodular and bedded, is reported from both the North Atlantic and Pacific oceans, but not the South Atlantic. Chert is associated with all lithologies and ages of sediment but is most common in siliceous sediments of Eocene or older age. The silica in nodular cherts is biogenic in origin. Basal sediments in the oceans are commonly enriched in iron. The iron-rich sediments formed when the basement was near the crest of the mid-ocean ridge and have moved to their present positions by seafloor spreading. (Knapp-USGS)
W73-13542

NEW JERSEY CONTINENTAL SHELF NEAR BOTTOM CURRENT METER RECORDS AND RECENT SEDIMENT ACTIVITY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
C. E. McClennen.
Journal of Sedimentary Petrology, Vol 43, No 2, p 371-380, June 1973. 5 fig, 1 tab, 41 ref.

Descriptors: *Continental shelf, *Bottom sediments, *Sedimentary structures, *Sediment transport, *Sedimentation, *New Jersey, Scour, Erosion, Littoral drift, Waves (Water), Currents (Water), Current meters.

Modern sedimentary processes associated with the ridge and depression topography of the New Jersey continental shelf were investigated with the aid of near bottom current meter measurements. Estimates of near bottom wave orbital velocities were derived from classical wave theory and

available surface wave observations. Four current meters were set 1.5 to 2.0 m above sea bottom in 30-, 59-, 74-, and 143-m depths for 9 to 11 days during the late springs of 1970 and 1971. The root mean square speeds of the meter records were 13.7, 11.8, 12.9, and 19.5 cm/sec in order of increasing depth, with a maximum recorded 2.5 minute average speed of nearly 40 cm/sec and a net southwesterly transport. Both current and wave data indicate reworking of the surface sand cover on the shelf. In determining the relative importance of wave vs current activity, the true value of the critical erosion velocity is of primary importance. The present physical reworking of the surface sediments is indicated independently by bottom photographs of ripples and by sedimentary structures, with reworking generally limited to the upper meter of sediment. No mechanism for the present formation of the larger scale ridge and depression topography is indicated by the currents measured or the wave considerations. (Knapp-USGS)
W73-13543

2K. Chemical Processes

DETERMINATION OF LOW PHOSPHATE CONCENTRATIONS IN SEAWATER BY AN ISOBUTYL ACETATE EXTRACTION PROCEDURE,
Osservatorio Geofisico Sperimentale, Trieste (Italy).
For primary bibliographic entry see Field 05A.
W73-13057

INTERACTION OF YELLOW ORGANIC ACIDS WITH CALCIUM CARBONATE IN FRESHWATER,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 05B.
W73-13058

A REACTIVE SILICATE BUDGET FOR THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
L. A. Codispoti, and D. Lowman.
Limnology and Oceanography, Vol 18, No 3, p 448-456, May 1973. 3 fig, 2 tab, 27 ref. ONR N-00014-67-A-0103-0014.

Descriptors: *Arctic Ocean, *Sea water, *Silicates, *Silica, *Water chemistry, Aqueous solutions, Provenance, Water circulation, Ocean currents.

Available data permit formulation of a reactive silicate budget for the Arctic Ocean. There is fairly good agreement between the input and removal terms. Arctic rivers do not appear to have unusually high reactive silicate concentrations and the budget indicates that the Arctic Ocean is not a major source for reactive silicate; it could even be a sink. The Bering Strait inflow may exit primarily via the Canadian Archipelago. (Knapp-USGS)
W73-13061

SIZE CLASSES OF ORGANIC CARBON IN SEAWATER,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-13062

A NEW METHOD FOR DETERMINING THE TOTAL CARBONATE ION CONCENTRATION IN SALINE WATERS,
Lamont-Doherty Geological Observation, Palisades, N.Y.
H. J. Simpson, and W. S. Broecker.
Limnology and Oceanography, Vol 18, No 3, p 426-440, May 1973. 11 tab, 13 ref.

Descriptors: *Chemical analysis, *Water analysis, *Carbon dioxide, *Carbonates, *Saline water, Aqueous solutions, Water chemistry, Analytical techniques.
Identifiers: *Carbonate analysis.

A new method of determining total carbonate ion content of saline waters requires measurement of the partial pressure of carbon dioxide gas (P CO2) in equilibrium with an initial solution, plus two more P CO2 measurements made after adding a known amount of strong base and after further adding boric acid. These three P CO2 measurements, plus the total inorganic carbon concentration are used to compute the total carbonate ion concentration of the original solution, without the use of any system of apparent dissociation constants. Experimental data for seawater samples using this method yield total carbonate ion concentrations in agreement with those calculated using Lyman's apparent dissociation constants for carbonic and boric acids. The method can be equally well applied to other saline natural waters. (Knapp-USGS)
W73-13063

ENZYMATIC NH3-N DETERMINATION: A SPECIFIC METHOD FOR THE DETERMINATION OF AMMONIA IN WATER AND SEDIMENTS,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 05A.
W73-13068

NUTRIENT CONTENT OF LITTER FALL ON THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE,
New Mexico Univ., Albuquerque. Dept. of Biology.
J. R. Gosz, G. E. Likens, and F. H. Bormann.
Ecology. Vol 53, No 5, p 769-784, 1972. Illus.
Identifiers: Cycling, Forests, *Litter fall, *Nutrients, Seasonality, *New Hampshire (Hubbard Brook Exp. Forest).

Litter fall was collected throughout the year beneath a mature northern hardwood forest in New Hampshire. The material, separated by species and plant part, was analyzed for dry weight and for 11 elements. Total aboveground litter fall averaged 5702 kg/ha per year; leaves, branches, stems, and bark contributed 49.1%, 22.2%, and 14.1% and 1.7% respectively. Other deciduous structures (i.e., bud scales, flowers, fruit), as well as insect frass and miscellaneous tissue, contributed 10.9%. The overstory contributed 98.0% of the total, and shrub and herbaceous layers contributed only 1.2% and 0.8%, respectively. The nutrient content of the litter totaled 140.4 kg/ha per year. The relative abundance was N > Ca > K > Mn > Mg > S > P Zn > Fe >Na > Cu. Nitrogen, Ca, and K accounted for 80.6% of the total, and Zn, Fe, Na and Cu contributed only 0.8%. The overstory, shrub, and herbaceous layers supplied 96.9%, 1.7% and 1.6% of the nutrients, respectively. Litter fall occurred throughout the year, but there were seasonal peaks for many types of tissues. Autumn was most important, accounting for 49.7% of the litter and 56.0% of the nutrients. Summer and winter seasons supplied similar quantities of litter, 21.2% and 22.4%; however, 22.6% of the total nutrient fall occurred during summer compared with only 17.2% during the winter. Spring months supplied 6.7% and 4.1% of litter and nutrients, respectively. Storms were very important in the timing of litter and nutrient fall. The extreme variability of litter fall is the result of differences between species, tissues, vertical structure of the vegetation, elevation, site and time of year. In spite of this variation, nutrient-budget studies reveal relatively small losses from the ecosystem. Large fluctuation in rates of nutrient flow, via litter fall, are readily absorbed within the ecosystem, thus preventing nutrient loss and maintaining efficient nutrient cycling.--Copyright 1973, Biological Abstracts, Inc.
W73-13100

ANALYSIS OF SOME INORGANIC CONSTITUENTS IN WELL WATERS AND THEIR SEDIMENTS,
Dental Coll. Hospital, Lucknow (India). Fluoride Study Unit.
For primary bibliographic entry see Field 04B.
W73-13151

A SIMPLE COULOMETRIC METHOD FOR THE DETERMINATION OF CHLORIDE IN NATURAL WATER,
Oslo Univ., (Norway). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-13181

A POTASSIUM-SELECTIVE SILICONE--RUBBER MEMBRANE ELECTRODE BASED ON A NEUTRAL CARRIER,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
For primary bibliographic entry see Field 05A.
W73-13185

THE DETERMINATION OF SELENIUM IN SEA WATER BY GAS CHROMATOGRAPHY WITH ELECTRON-CAPTURE DETECTION,
Okayama Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 05A.
W73-13186

ION-SELECTIVE CARBON-PASTE ELECTRODES FOR HALIDES AND SILVER (I) IONS,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Technology.
For primary bibliographic entry see Field 05A.
W73-13187

THE CALIBRATION AND RESPONSE OF ION--SELECTIVE ELECTRODES AT LOW CONCENTRATIONS OF PRIMARY IONS,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
P. L. Bailey, and E. Pungor.
Analytica Chimica Acta, Vol 64, No 3, p 423-430, May 1973. 6 fig, 1 tab, 14 ref.

Descriptors: *Calibrations, *Methodology, Electrolytes, Permselective membranes, Volumetric analysis, Chemical analysis, Aqueous solutions, Iodides, Heavy metals, Electric currents, Measurement, Electrolysis.
Identifiers: *Electrochemical behavior, *Ion selective electrodes, Copper electrodes, Silver electrode, Iodide electrodes, Unbuffered media, Reproducibility, Accuracy, Electrolytic generation technique, Current efficiencies, Membrane electrodes, Chemical concentration, Coulometry, Silver, Amperometric titration, Potassium perchlorate, Potassium nitrate, Magnesium sulfate, Zinc sulfate, Perchloric acid.

The responses of silicone-rubber based ion-selective membrane electrodes (iodide and silver ion-selective electrodes) to low concentrations of primary ions have been studied in various unbuffered media. In particular, the failure region of the electrodes was studied. Reproducible and accurately known concentrations of ions (0.1-0.0007 mM were prepared by electrolytic generation. A necessary and integral part of the work was to measure the current efficiency for the generation of the ions in the different media. Such efficiencies were measured coulometrically. Results obtained from the calibration of the iodide-ion selective electrode

in various media are presented, and results with the silver and copper ion-selective electrodes are briefly discussed. The advantages of the electrolytic generation technique are discussed. (Holoman-Battelle)
W73-13188

RECENT RESULTS ON THE DYNAMIC RESPONSE OF PRECIPITATE-BASED ION--SELECTIVE ELECTRODES,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
K. Toth, and E. Pungor.
Analytica Chimica Acta, Vol 64, No 3, p 417-421, May 1973. 3 fig, 2 ref.

Descriptors: *Mathematical studies, Chemical reactions, Methodology.
Identifiers: *Desolvation, *Ion selective electrodes, *Electrochemical behavior, *Data interpretation, Copper electrodes, Response time, Characterization, Half-life, Electromotive force.

The e.m.f. vs. time curves of the precipitate-based ion-selective electrodes (copper (II)-selective electrode) have been interpreted mathematically on the basis of the desolvation of ions at the electrode surface. A new method has been suggested for the characterization of ion-selective electrodes by the half-life time of the first-order desolvation reaction. (Holoman-Battelle)
W73-13189

EFFECTS OF TEMPERATURE AND CHEMICAL TREATMENTS ON THE CHEMICAL COMPOSITION OF ALKALINE WATER,
Ministry of Agriculture, Bangkok (Thailand). Rice Dept.
For primary bibliographic entry see Field 05G.
W73-13191

STUDIES ON SODIUM WATER FOR IRRIGATION. EFFECT OF ADDITION OF CATIONS: K, CA OR MG,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
For primary bibliographic entry see Field 03C.
W73-13192

A RUGGED SILVER-SILVER CHLORIDE ELECTRODE FOR FIELD USE,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
For primary bibliographic entry see Field 07B.
W73-13193

SOME PROBLEMS ASSOCIATED WITH THE ANALYSIS OF MULTIRESPONSE DATA,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 07C.
W73-13195

THE DETERMINATION OF MOLYBDENUM IN SEA WATER BY HOT GRAPHITE ATOMIC ABSORPTION SPECTROMETRY AFTER CONCENTRATION ON P-AMINOBENZYLCELLULOSE OR CHITOSAN,
Bologna Univ. (Italy). Ciamician Chemical Inst.
For primary bibliographic entry see Field 05A.
W73-13199

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.

Available from GPO, Washington, D.C. 20402. Price $2.75. Geological Survey Water-Supply Paper 2099, 1972. 359 p, 1 fig, 39 ref.

Descriptors: *Water quality, *Chemical analysis, *Surface waters, *California, Basic data collections, Hydrologic data, Water chemistry, Streamflow, Flow rates, Sediment transport, Particle size, Sediment yield, Water temperature.

During the water year ending September 30, 1968, the Geological Survey maintained 184 stations on 123 streams in California for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 62 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 115 and daily at 29 stations. At chemical-quality stations where data are continuously recorded at the stream site (monitors), the records consist of daily maximum, minimum, and mean values for each constituent measured. Quantities of suspended sediment are reported for 57 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 54 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. (Woodard-USGS)
W73-13200

WATER RESOURCES OF BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02A.
W73-13209

SEPARATION OF MANGANESE, IRON, COBALT, NICKEL, COPPER, ZINC AND CADMIUM BY REVERSED-PHASE CHROMATOGRAPHY USING TRI-N-OCTYLAMINE AS THE STATIONARY PHASE AND APPLYING A GRADIENT ELUTION TECHNIQUE, (EXTRAKTIONSCHROMATOGRAPHISCHE TRENNUNG VON MANGAN, EISEN, KOBALT, NICKEL, KUPFER, ZINK UND CADMIUM UNTER VERWENDUNG VON TRI-N-OCTYLAMIN ALS STATIONARE PHASE UND GRADIENTELUTION),
Deutsche Akademie der Wissenschaften zu Berlin, Dresden (East Germany). Central Inst. for Solid Matter Physics and Raw Materials Research.
For primary bibliographic entry see Field 05A.
W73-13234

GAS CHROMATOGRAPHY OF TL, SE, TE, HG, AS, SB, BI, SN AS PHENYL COMPOUNDS, (GAS-CHROMATOGRAPHIE VON TL, SE, TE, HG, AS, SB, BI, SN ALS PHENYLVERBINDUNGEN),
Tieraerztlichen Hochschule, Hanover (West Germany). Chemical Inst.
For primary bibliographic entry see Field 05A.
W73-13235

EVIDENCE FOR BUFFERING OF DISSOLVED SILICON IN FRESH WATERS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 05B.
W73-13238

ATOMIC EMISSION SPECTROMETRY WITH AN INDUCTION-COUPLED HIGH-FREQUENCY PLASMA SOURCE. THE DETERMINATION OF IODINE, MERCURY, ARSENIC AND SELENIUM,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-13254

PRECISE SHIPBOARD DETERMINATION OF DISSOLVED NITROGEN, OXYGEN, ARGON, AND TOTAL INORGANIC CARBON BY GAS CHROMATOGRAPHY,
Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W73-13255

ATOMIC FLUORESCENCE SPECTROMETRY WITH A GRAPHITE ROD ATOMIZER AND THERMOSTATED ELECTRODELESS DISCHARGE LAMPS,
Florida Univ., Gainesville. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-13260

APPLICATION OF A SULFATE-SENSITIVE ELECTRODE TO NATURAL WATERS,
Texas Instruments, Inc., Dallas.
For primary bibliographic entry see Field 05A.
W73-13276

DETERMINATION OF NITROGEN-15 BY CHEMICAL IONIZATION MASS SPECTROMETRY,
Rockefeller Univ., New York.
For primary bibliographic entry see Field 05A.
W73-13280

CHROMATOGRAPHY OF 48 METAL IONS ON STANNIC ARSENATE AND PLAIN PAPERS IN BUTANOL-NITRIC ACID MEDIA,
Z. H. Coll. of Engineering and Technology, Aligarh (India).
For primary bibliographic entry see Field 05A.
W73-13281

MICRO AND SEMIMICRO DETERMINATION OF THIOLS WITH ION-SELECTIVE ELECTRODES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 05A.
W73-13289

CHEMICAL COMPOSITION OF OCEAN USING A DIRECT MEASURING OCEANOGRAPHIC ELECTROCHEMICAL PROBE,
California Univ., Los Angeles. Dept. of Geology.
I. R. Kaplan, and S. Ben-Yaakov.
Available from the National Technical Information Service as UCLA-34-P-178-X-3, $3.00 in paper copy, $1.45 in microfiche. Final Report 1972. 156 p, 5 fig, 3 tab, 38 ref. AEC AT (04-3)-34.

Descriptors: *Sea water, *Chemical analysis, Electrochemistry, Hydrogen ion concentration, Pacific Ocean, Mixing, Carbon dioxide, Dissolved oxygen, Saline water, On-site investigations, Aquatic productivity, Methodology.
Identifiers: *Electrochemical probe, Ionic diffusion, Carbonate saturation, Chemical composition, Glass electrodes.

These studies were primarily concerned with the investigation of carbonate saturation in the ocean by the application of an in situ probe. The method involved the construction of an electrochemical measurement system which was used to depths of 4,500 m. A glass electrode was allowed to reach equilibrium with a calcium carbonate suspension and the changes in pH were measured. This pH change could then be related to the degree of saturation of the carbonate in seawater. Studies also were undertaken to measure ionic diffusion from seawater to less dilute solutions. It was established that ionic complexing may extensively modify the fluxes of migrating ions. Theoretical studies were conducted on the effect of complexing on the apparent dissociation constants in the carbonate system. It was shown that these could change sig-

nificantly in interstitial waters having approximately the same ionic strength of seawater, but a different composition. A study was also made of the CO2-O2 system in the North Eastern Pacific. Variations in CO2 and O2 were related to production and consumption rates and to mixing models of ocean currents. (Mortland-Battelle)
W73-13294

IN SITU ACTIVATION ANALYSIS OF MARINE SEDIMENTS WITH CALIFORNIUM-252,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
N. A. Wogman, H. G. Rieck, Jr., J. R. Kosorok, and R. W. Perkins.
Available from the National Technical Information Service as BNWL-SA-4434, $3.00 in paper copy, $1.45 in microfiche. Report No CONF-721010-4, September 1972. 14 p, 2 fig, 2 tab, 9 ref.

Descriptors: *Neutron activation analysis, *Sediments, *On-site investigations, *Metals, *Halogens, Sulfur, Calcium, Chlorine, Molybdenum, Magnesium, Aluminum, Iron, Potassium, Sodium, Nickel, Cobalt, Copper, Tin, Titanium, Bromine, Iodine.
Identifiers: *Detection limits, Cf-252, Nuclear probe, Indium, Gallium, Neodymium, Barium, Vanadium, Europium, Columbium, Tungsten, Antimony, Dysprosium, Silver, Osmium, Rhodium, Platinum, Lanthanum, Iridium, Arsenic.

A seabed nuclear probe has been developed which permits the measurement of up to 33 elements at the parts per thousand to parts per million levels in continental shelf areas. These elements include S, Ca, Cl, Mo, Mg, Al, F, K, Na, In, Ga, Nd, Ni, Co, Cu, Ba, Sn, V, I, Eu, Ti, Cb, W, Sb, Dy, Ag, Os, Br, Rh, Pt, La, Ir, and As. The probe consists of a neutron irradiation source, californium-252, which neutron activates the elements in the minerals of interest. These resulting radio-active elements emit characteristic gamma radiation which is analyzed in situ in 2- to 10-minute counting intervals with a Ge (Li) detector system. Details of the irradiation source, the Ge (Li) detector, and spectra taken in situ in a marine environment are discussed with respect to the detection of the minerals at concentrations of economic interest. (Little-Battelle)
W73-13295

IMPROVED WATER ANALYSIS KIT,
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 07B.
W73-13297

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS.
Wisconsin Univ., Madison. Inst. of Environmental Studies.
For primary bibliographic entry see Field 05A.
W73-13299

RELATIONSHIP BETWEEN THE CARBON ISOTOPE COMPOSITION OF SOIL CO2 AND DISSOLVED CARBONATE SPECIES IN GROUNDWATER,
Geological Survey, Washington, D.C.
C. T. Rightmire, and B. B. Hanshaw.
Water Resources Research, Vol 9, No 4, p 958-967, August 1973. 4 fig, 3 tab, 29 ref.

Descriptors: *Stable isotopes, *Carbon, *Isotope fractionation, *Water chemistry, *Hydrogeology, Groundwater, Groundwater movement, Provenance, Climatology, Tracers, Florida, Soil water, Soil gases.
Identifiers: *Carbon isotopes.

To understand the carbonate geochemistry of an aquifer system, it is helpful to determine the sources of carbon in the dissolved carbonate species. Samples of ground litter, soil organic matter, soil CO2, and groundwater were collected in the area of recharge to the principal artesian aquifer of central Florida and were analyzed for C-13 content. Analytical results yield consistent C-13/C-12 values for soil organic matter; delta C-13 (PDB) ± 23 plus or minus 1 part per thousand. The C-13/C-12 ratio of the litter samples ranges from delta C-13 (PDB) of -18.2 to -29.5 parts per thousand and indicates the presence of both Calvin and Hatch-Slack cycle plants. The C-13/C-12 of the soil CO2 ranges from -14.7 to -21.3 parts per thousand, which is consistent with the trend observed in the litter. The relationship between C-13/C-12 of the dissolved carbonate and the percent calcite saturation indicates that the C of the source CO2 is within the range expected for a humid, subtropical environment. (Knapp-USGS)
W73-13360

HYDROCHEMICAL ENVIRONMENTS OF CARBONATE TERRAINS.
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
J. J. Drake, and R. S. Harmon.
Water Resources Research, Vol 9, No 4, p 949-957, August 1973. 4 fig, 4 tab, 22 ref.

Descriptors: *Karst hydrology, *Water chemistry, Water analysis, Geochemistry, Statistics, Carbonate rocks, Hydrogeology, *Pennsylvania.

Waters within a carbonate aquifer may be classified on a hydrologic basis. To test the classification method, 166 reliable chemical analyses of carbonate waters from Pennsylvania were grouped on a hydrologic basis, and the groupings were tested by a stepwise linear discriminant function analysis. Two parameters (degree of calcite saturation and equilibrium carbon dioxide partial pressure) are sufficient to distinguish the groups at the 0.005 confidence level and provide a reliable way to examine the geochemical evolution of the waters in the carbonate drainage basin. (Knapp-USGS)
W73-13361

ON THE UPTAKE OF TRITIUM BY SOIL WATER AND GROUNDWATER,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 02F.
W73-13372

SIMULTANEOUS TRANSPORT OF SOLUTES AND WATER UNDER TRANSIENT UNSATURATED FLOW CONDITIONS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil Physics.
For primary bibliographic entry see Field 02G.
W73-13380

EFFECT OF SOLUTE DISPERSION ON THERMAL CONVENTION IN A POROUS MEDIUM LAYER,
Technion-Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W73-13381

EIGHTEENTH ANNUAL CONFERENCE ON BIOASSAY, ENVIRONMENTAL AND ANALYTICAL CHEMISTRY, OCT. 10-11, 1972, PROGRAM AND ABSTRACTS.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A.
W73-13415

FIXING CATION INTERACTION WITH BLISTER-LIKE OSMOTIC SWELLING ON VERMICULITE CLEAVAGES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-13425

ON PROPERTIES OF SEAWATER DEFINED BY TEMPERATURE, SALINITY AND PRESSURE,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
G. Veronis.
Journal of Marine Research, Vol 30, No 2, p 227-255, 1972. 17 fig, 6 tab, 14 ref. NSF GA 11410.

Descriptors: *Temperature, *Salinity, *Pressure, *Mathematical models, *Ocean circulation, Oceanography, Seawater, Model studies, Atlantic Ocean, Data collections, Deep-water habitats, Hydrologic equation, Graphical analysis, Data processing, Density.

Hydrographic station data consisting principally of temperature and salinity determinations probably contain substantially more information than has been derived from them in the past. The quantity that is orthogonal to potential-density curves in the Theta S plane is suggested as a useful variable to complement the information contained in potential density. A polynomial expression that is suitable for computer calculations is derived from hydrographic station data. Examples of hydrographic data from the Atlantic are plotted on an orthogonal variable - potential density diagram showing many features exhibited in the temperature-salinity plane. Vertical sections of the variable provide information about mixing in different parts of the Atlantic. The variable may serve as a good tracer for abyssal water movements. An exploration of the dynamical significance of potential density is presented beginning with the question of stability of abyssal water. Examples show that analysis of potential density alone can lead to incorrect conclusions because seawater is a multicomponent thermodynamic system and the thermodynamic coefficients are functions of pressure, salinity, and temperature. A local potential density is derived which gives a precise picture of gravitational stability in the vertical direction. (Jerome - Vanderbilt)
W73-13477

OCEANIC SEDIMENTS AND THEIR DIAGENESIS: SOME EXAMPLES FROM DEEP-SEA DRILLING,
Scripps Inst. of Oceanography, La Jolla, Calif. Deep Sea Drilling Project.
For primary bibliographic entry see Field 02J.
W73-13542

ESTIMATING WATER QUALITY FROM ELECTRICAL LOGS,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-13556

ANALYTICAL APPLICATIONS OF POLYAMINE-POLYUREA CHELATING RESINS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05A.
W73-13571

WATER: EXAMINATION, ASSESSMENT, CONDITIONING, CHEMISTRY, BACTERIOLOGY, BIOLOGY,
For primary bibliographic entry see Field 05A.
W73-13573

CHANGE IN THE FREE AMINO ACID CONTENT IN CRYPTOMERIA JAPONICA TRANSPLANTS UNDER VARIOUS SOIL MOISTURE CONDITIONS,
Government Forest Experiment Station, Tokyo (Japan).
T. Mori, Y. Sakagami, and K. Doi.
J Jap For Soc. Vol 53, No 11, p 350-354. 1971. Illus

Identifiers: Alanine, *Amino acid, Aspartic-acid, Chromatography, *Cryptomeria-Japonica, Glutamic-Acid, Metabolism, Proline, *Soil moisture, Transplants.

Fourteen amino acids and 2 amides were separated from 80% ethanol extracts of the shoots and roots by the paper chromatographic method. Alanine, proline, aspartic and glutamic acids comprised 70 approximately 80% of the total amino acids. In the shoots, the total amino acid concentration increased until the water content in the shoots declined to about 120%. Further decline of water content did not cause any significant change in the total amino acid concentration. In the roots, the concentration continued to increase during the decrease of water content. Alanine and proline in the shoots increased under water stress with water content lower than 120%, while almost all other amino acids decreased after they reached the maximum levels at about 120% of the water content. Proline in the upper shoots increased, more than 10-fold of the original level, with the decrease of water content. Moderate soil moisture deficit caused an extreme decrease of water content in the transplants, and water stress in the transplants seemed to strongly influence the amino acid metabolism.--Copyright 1973, Biological Abstracts, Inc.
W73-13592

HYDROLOGICAL CHEMICAL AND PHYSICAL INVESTIGATIONS ON THE ADIGE RIVER AT BOARA PISANI. JUNE 1968-JUNE 1970,
Istituto di Biologia del Mare, Venice (Italy).
V. U. Fossato.
Arch Oceanogr Limnol. Vol 17, No 2, p 105-123. 1971. Illus. English summary.
Identifiers: Chemical studies, Hydrological studies, *Italy (Adige River), Minerals, *Nutrients, Physical studies, Rivers, *Calcium, *Magnesium.

The nutrients of the river Adige to the Adriatic Sea and the seasonal variations of alkalinity and of Ca and Mg concentrations were investigated bimonthly for 2 yr Boara Pisani. Statistically significant correlations between the flow of the river and the concentrations of some nutrients (nitrites, nitrates and phosphates) could be shown. The nutrient concentrations and the relative oxygenation seemed to indicate a low pollution level in this river. A correlation was also found between the seasonal changes in total alkalinity, in Ca and Mg concentrations, and in the flow and temperature of the river. This is explained by the hypothesis that CO2 causes a slow transformation of the insoluble carbonates into soluble bicarbonates.--Copyright 1973, Biological Abstracts, Inc.
W73-13596

HYDROLOGICAL, CHEMICAL AND PHYSICAL INVESTIGATIONS ON THE PO RIVER AT POLESELLA: JUNE 1968-JUNE 1970,
Istituto di Biologia del Mare, Venice (Italy).
V. U. Fossato.
Arch Oceanogr Limnol. Vol 17, No 2, p 125-139. 1971. English summary.
Identifiers: Chemical studies, Hydrological studies, Minerals, *Nutrients, Physical studies, Rivers, *Italy (Po River), *Calcium, *Magnesium.

The nutrients of the Po River to the Adriatic Sea and the seasonal variations in alkalinity and in Ca and Mg concentrations were investigated bimonthly for 2 yr at Polesella. The nutrient concentrations were very variable. A correlation existed between the seasonal changes in total alkalinity and in Ca and Mg concentrations, and in flow and temperature of the river.--Copyright 1973, Biological Abstracts, Inc.
W73-13598

DETERMINATION OF MERCURY IN GEOLOGIC MATERIALS BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-13649

2L. Estuaries

THE COASTAL ZONE AS AN INTEGRAL ELEMENT OF WATER-RESOURCE SYSTEMS,
Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning.
A. A. Dzurik.
Water Resources Bulletin, Vol 9, No 4, p 735-745, August 1973. 3 fig, 3 tab, 10 ref.

Descriptors: *Coasts, Water management (Applied), *Estuaries, *Planning, Water resources development, Comprehensive planning, Multiple-purpose projects.

The coastal zone is subject to more severe problems and complex issues than more narrowly-defined land and water resources. It must be viewed as an important component of water-resource systems. Generally defined, the coastal zone is the area of transition from land to sea, and from freshwater to saltwater. Estuaries are the key element of this zone and are the world's most biologically productive water bodies. Freshwater flow has impact upon the characteristics and quality of estuarine waters, and upon sedimentary deposits along the coast. Man has and will continue to concentrate his activities and cities along the coasts. The uses of coastal resources are varied and often conflicting, and thus coastal-zone planning and management is necessary. Rational determination of public policy for the coastal zone must recognize factors relating to (a) physical, chemical, and biological characteristics, (b) urbanization and development, and (c) governmental capacity for adequate policies and programs. Inherent is the realization that neither complete exploitation nor preservation is appropriate or practicable. A balance must be maintained to maximize long-term as well as immediate benefits through appropriate management of coastal resources within the framework of water-resource systems. (Knapp-USGS)
W73-13036

EXTENSIVE OXYGEN DEPLETION IN MOBILE BAY, ALABAMA,
Alabama Marine Resources Lab., Dauphin Island.
For primary bibliographic entry see Field 05C.
W73-13065

COMPETITION FOR UREA AMONG ESTUARINE MICROORGANISMS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-13108

STUDIES ON VIBRIO PARAHAEMOLYTICUS IN KOREAN COASTAL WATERS: I. THE DISTRIBUTION OF V. PARAHAEMOLYTICUS (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
For primary bibliographic entry see Field 05B.
W73-13118

PROBLEMS OF WATER RESOURCE DEVELOPMENT IN THE GULF COAST ESTUARINE ZONE,
Forest Service (USDA), New Orleans, La. Southern Forest Experiment Station.
L. C. Irland, and J. W. Tarver.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 738-753, (1972). 2 fig, 3 tab, 25 ref.

Descriptors: *Estuarine environment, *Mississippi River, *Gulf of Mexico, *Louisiana, *Water resources development, *Ecosystems, *Planning, Economics, Legal aspects, Hydrology, Deltas, Environmental engineering, Public rights, Governments, *Risks.
Identifiers: Human activities.

The Gulf Coast Estuarine Region, based upon the Delta of the Mississippi River, is one of the world's largest and most productive estuaries. Connected by water input from streams and the ebb and flow of tides, the region is an ecological unit. Human activities, including trade, manufacturing, and oil production, have altered natural flow patterns and reduced estuarine productivity. Purposeful coordinated planning is needed, but even if it were established, severe uncertainties would remain: (1) Uncertain knowledge, including ignorance of basic hydrologic and biological processes in the region, hindering evaluation of project effects on the estuarine system; (2) uncertain prediction, concerning primarily the difficulty of forecasting economic activity in the area, hindering evaluation of project benefits; and (3) uncertain control (legal) over resource users, complicating comprehensive planning. The resources of the Gulf Coast region, the current activities of man in the area, and their ecological impact are described. Also described are the uncertainties of economic prospects, legal relations that affect resource planning, and priority research needs; the implications of these uncertainties are considered. Possible adjustments to uncertainties are described, including research expansion, setting of safe minimum standards, and establishment of statewide land use control. (See also W73-13134) (Bell-Cornell)
W73-13152

TRENDS IN METHODOLOGY FOR EVALUATION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS,
Fisheries Research Board of Canada, West Vancouver, (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 05C.
W73-13171

INORGANIC NITROGEN REMOVAL FROM WASTEWATER: EFFECT ON PHYTOPLANKTON GROWTH IN COASTAL MARINE WATERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-13179

BRIEF FIELD GUIDE TO INTERTIDAL SEDIMENTS, MINAS BASIN, NOVA SCOTIA,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
G. V. Middleton.
Maritime Sediments, Vol 8, No 3, p 114-122, December 1972. 4 fig, 35 ref.

Descriptors: *Sediments, *Tides, *Sediment transport, Canada, Currents (Water), Tidal waters, Tidal effects.
Identifiers: *Bay of Fundy, *Minas Basin.

The Bay of Fundy is famous for its tides which are reputed to have the greatest range of any in the world. The cause of the very large tidal range is resonant amplification of the semidiurnal tidal component. The resonant condition is critically dependent on the dimensions of the Bay, and these dimensions must have been achieved only during the last 4,000 years. Changes in sea level have considerably affected tidal amplitude. The main growth in tidal amplitude took place as the bay both widened and, on the average, shallowed with the main effect due to shallowing some 4,000 to 1,000 years ago. Much of the apparent rise in sea level may therefore be due to increasing tidal amplitude (and therefore rise in the higher high water level that is used as a sea level datum). However,

there is still an excess rate of subsidence of 7-9 cm/100 years. Depths in the Minas Passage reach 400 ft but are generally not more than 30 ft within the basin itself. Tidal velocities are extreme in the Minas Passage, reaching 11 knots, are generally 3 to 4 knots in the open basin, and decrease near the shore to a maximum of 1 to 3 knots over the main sand bodies. Much of the Minas Passage is underlain by bedrock, swept bare of sediment by the strong tidal currents. The general distribution of modern intertidal sediments in the Minas Basin-Cobequid Bay is reviewed. (Knapp-USGS)
W73-13204

RECONNAISSANCE SURVEY OF HOG ISLAND, PRINCE EDWARD ISLAND,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 02J.
W73-13205

BARRIER ISLANDS, SAND SPITS AND DUNES IN THE SOUTHERN GULF OF ST. LAWRENCE,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 02J.
W73-13206

A NOTE ON WIND AND WAVE CONDITIONS IN THE SOUTHERN GULF OF ST. LAWRENCE,
McMaster Univ., Hamilton (Ontario).
E. A. Bryant, and S. B. McCann.
Maritime Sediments, Vol 8, No 3, p 101-103, December 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Waves (Water), *Ocean waves, Beach erosion, Winds, Surf, Refraction (Water waves), Fetch.
Identifiers: *Gulf of St. Lawrence.

The Gulf of St. Lawrence is connected to the Atlantic via two narrow straits--the Strait of Belle Isle to the northwest and Cabot Strait to the east--but the important waves are generated within the Gulf rather than entering from the open ocean via these straits. Wave systems tend to be concentrated on particular stretches of coastline due to wave refraction in the southern part of the Gulf. The prevalent winds blow from between south and northwest, accounting for 58% of total wind directions but only 40% of maximum wind speeds for each month. The strongest winds come from between north and east-southeast. The significance of this pattern is that the prevalent winds are offshore on the open gulf sandy coasts of New Brunswick and Prince Edward Island, and that there are many periods when wave action is relatively light. However, the strongest winds, though less frequent, blow over long fetches generating the dominant waves, which are of low frequency but large magnitude. (Knapp-USGS)
W73-13207

ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MNAGEMENT,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
H. G. Goodell, C. M. Woolheater, and K. L. Echternacht.
Available from NTIS, Springfield, Va 22151 as PB-214 547 Price $3.00 printed copy; $1.45 microfiche. Geological Survey Interagency Report USGS-243, September 1972. 132 p, 24 fig, 33 tab, 28 ref. NASA W-13165, Task 160-75-01-32-10-, USGS 14-08-001-12540.

Descriptors: *Remote sensing, *Land management, *Land use, Environment, Coastal plains, Aerial photography, Mapping, Topography, Data collections, Erosion, Water pollution sources, Climatic data, Census, Soil environment, Water resources, Surface water, Groundwater, Reviews.
Identifiers: *Central Atlantic coastal zone, Marine resources management.

The potential of remote sensing both as a source of data and as the basis for an information system for resource analysis and management within the coastal zone is described. Criteria are presented for a computer based model for forecasting the environmental consequences of resource allocations involving land use decision. Its ultimate efficiency will depend on the accuracy of the algorithms which link land use to a specific environmental impact and on the identification of the synergistic effects of these impacts. Two major data sources are used: land use data as identified principally by remote sensing, and dynamic climatological data to be developed from the National Weather Records Center of NOAA. The demonstration project suggests the establishment of RICHEL, an environmental laboratory, wherein the impact algorithms initially used in forecasting could be verified by field data so that the precision of the algorithms could be refined. (Woodard-USGS)
W73-13210

MARINE MICROBIOLOGY, FIVE-YEAR PROGRESS REPORT, 1967-1972,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W73-13339

MARINE SCIENCES.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-13343

THE USE OF WATER QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THERMAL EFFECTS PROBLEM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05B.
W73-13479

HEAVY MINERAL CONCENTRATING PROCESSES AND DENSITY/SHAPE/SIZE EQUILIBRIA IN THE MARINE AND COASTAL DUNE SANDS OF THE APALACHICOLA, FLORIDA, REGION,
Florida State Univ., Tallahassee. Dept. of Geology.
F. W. Stapor, Jr.
Journal of Sedimentary Petrology, Vol 43, No 2, p 396-407, June 1973. 4 fig, 5 tab, 16 ref.

Descriptors: *Mineralogy, *Sands, *Beaches, *Dunes, *Sediment transport, Sediment sorting, Specific gravity, Particle shape, Particle size, Winds, Surf, Littoral drift, *Florida, Gulf of Mexico.
Identifiers: *Heavy minerals, Apalachicola (Fla).

Two marine concentrating processes operate to produce the heavy mineral deposits found on beaches in the vicinity of Appalachicola, Florida. The process operating in the more energetic Gulf of Mexico tends to remove the coarser grains from initial populations. This results in a relatively fine-grained black sand concentrate being delivered to the beach for deposition. The reverse occurs in the less energetic bays and sounds; the process tends to remove the finer grains and the deposits are coarser. The quartz associated with both types of deposits is in equilibrium, but not settling equivalence, with ilmenite, staurolite, and kyanite. Settling equivalence is present among the ilmenite, staurolite, and kyanite populations of the sheltered beach deposits only. Zircon and rutile are too small in grain size to be in equilibrium with the other minerals; this probably reflects smaller variances of the initial populations. The dune deposits were concentrated by gentler-than-normal winds reworking beach sands containing areally limited heavy mineral deposits. Ilmenite, staurolite, kyanite, and quartz are in settling equivalence, the zircon and rutile are too small. Good evidence exists for a shape-based decrease in grain size for kyanite and rutile during wind transport. (Knapp-USGS)
W73-13540

HYDRAULIC SAND-MODEL STUDY OF THE CYCLIC FLOW OF SALT WATER IN A COASTAL AQUIFER,
Geological Survey, Phoenix, Ariz.
J. M. Cahill
Geological Survey Professional Paper 575-B, p B240-244, 1967. 4 fig, 5 ref.

Descriptors: *Saline water-freshwater interfaces, *Model studies, *Tracers, Tidal waters, Saline water intrusion, Hydraulic models.
Identifiers: *Coastal aquifers, *Zone of diffusion, Nonoscillatory motion, Oscillatory motion, Time-lapse photography.

Model studies demonstrate visually that 'cyclic flow' takes place in the denser fluid when fresh water seaward over intruding ocean water. When tidal fluctuations are simulated in the model by alternately raising and lowering the level of the free body of salt water, additional mixing of the two miscible fluids occurs and additional salt water is transported into the fresh-water region. The fluid movement was observed by following colored tracers that were injected into both fluids. These studies indicate that the degree of salt-water intrusion is controlled primarily by the flow of the fresh water rather than by tidal effects. (Campbell-NWWA)
W73-13558

CHANGES DURING FOUR YEARS IN THE AQUATIC MACROVEGETATION IN A FLAD IN NORTHERN STOCKHOLM ARCHIPELAGO,
Umea Univ. (Sweden). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-13580

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER FROM GEOTHERMAL RESOURCES,
California Univ., Berkeley. Sea Water Conversion Lab.
A. D. K. Laird.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 177-196, 1973. 5 fig, 3 tab, 11 ref.

Descriptors: *Desalination, *Geothermal studies, *Electric power, Thermal powerplants, Economics, Distillation, Water resources development, Energy, Water sources.
Identifiers: *Geothermal power.

Geothermal energy is a potentially clean source of large amounts of power. Water carries thermal energy from the reservoirs to the surface. In some cases, condensate from steam turbines may be available as freshwater supplies. Distillation is a means of using geothermal energy for making more freshwater available. Consequently, large-scale geothermal distallation is a component of several energy production schemes. (See also W73-13214) (Knapp-USGS)
W73-13223

APPARATUS FOR DISTILLATION OF FLUIDS,
T. R. Best, Jr.

U.S. Patent No. 3,741,879, 5 p, 7 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1417, June 26, 1973.

Descriptors: *Patents, *Distillation, *Evaporation, *Condensation, *Desalination, Sea water, Saline water, Salt water, Separation techniques, Potable water, Equipment.

The evaporation and condensation unit comprises a vertical outer shell with horizontal partitions dividing the shell's interior into an upper vapor distribution region, and intermediate heat transfer region and a lower condensate collection region. Heat transfer tubes extend vertically through these regions. There is a sump near the bottom of the heat transfer region for containing liquid which flows down along the outer surfaces of the tubes. Fluids are subjected to distillation by causing vapors to pass vertically through the tubes while a cooler liquid film flows over the outside of the tubes. The vapors condense and give up heat to the liquid film causing a portion to vaporize. A vapor outlet is mounted in the shell to permit emission of the vapors. (Sinha-OEIS)
W73-13322

PROCESS AND SYSTEM FOR EXTRACTING SALTS, CONCENTRATED BRINE, AND/OR PURE WATER FROM SALINE WATER,
Hydro Chemical and Mineral Corp., New York. (assignee)
A. Osdor.
U.S. Patent No. 3,741,878, 11 p, 13 fig, 3 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1417, June 26, 1973.

Descriptors: *Patents, *Desalination, *Evaporation, *Condensation, Saline water, Brine, Salt water, *Water treatment, *Flash distillation, Heat transfer, Sea water, Potable water, Salts.

A system is described for flash distillation of a liquid mixture including saline water and an immiscible liquid having both a different density and a lower vapor pressure. The liquids are intimately mixed and continuously remixed during passage through each evaporator stage and U-tube connections so that heat transfer is maintained between the immiscible liquid and saline water droplets accompanying flashing. The liquids flow with turbulence and at a velocity to maintain the intimate mixing. A quanity of the solvent is vaporized while the immiscible liquid remains in the liquid state, thereby cooling the resultant mixture. The cooled immiscible liquid is separated from the cooled residual solution. The immiscible liquid is reheated by causing it to flow down by gravity through a series of condensers disposed at decreasing elevations as solvent evaporated from the solution is condensed. The condensers display increasing temperature and pressure conditions with decreasing elevation. The immiscible liquid is separated from the condensed solvent leaving the condenser. Pure water is vaporized until substantially all of the CaCO3 and most of the CaSO4 is precipitated with the remaining CaSO4 being in super-saturated solution. Precipitated salts settle out and the resultant mixture is fed into a settling tank where remaining salts settle out and the immiscible liquid is separated out. (Sinha-OEIS)
W73-13323

MULTI-STAGE FLASH DISTILLATION PROCESS,
A. R. Spicacci.
U.S. Patent No 3,734,835, 5 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1307, May 22, 1973.

Descriptors: *Patents, *Desalination, *Descaling, *Flash distillation, Separation techniques, *Water purification, Water quality, *Evaporators, *Heat exchangers, Treatment, Equipment.

Feed liquid, progressively preheated by passage along a primary flow path in heat exchange relation with vapor zones of successively staged flash evaporation chambers, is diverted from at least one region of the primary flow path directly into an associated flash liquid zone having a flash liquid temperature equal to the temperature of the feed liquid. Some of the streams are treated with scale inhibitor. Each stream is diverted from the primary flow path when the preheated liquid in the stream attains a temperature slightly below the temperature at which scale deposition tends to occur. (Sinha-OEIS)
W73-13336

3B. Water Yield Improvement

ENGINEERING HYDROLOGY,
Oregon State Univ., Corvallis. Water Resources Research Inst.
P. C. Kingeman.
Available from the National Technical Information Service as PB-222 608, $3.00 in paper copy, $1.45 in microfiche. Project completion report, June 1973. 36 p, 19 ref. OWRR A-001-ORE (19).

Descriptors: Hydrology, *Water yield, *Water shed management, Measurements, *Sediment transport, *Gravels, Spawning, *Oregon, *Silts, *Forecasting, Anadromous fish.

Results are summarized of a six-year study dealing with the engineering aspects of the hydrology of water yield prediction and related problems. The study emphasized (a) the identification of critical problem areas for hydrologic research in Oregon, (b) the planning, development, and coordination of interdisciplinary research and education in hydrology, (c) investigation of the influence of landform and precipitation parameters on the water yield from watersheds, (d) prediction of water yield from watersheds in the Oregon Coast Range, (e) sediment transport in coarse-bedded streams, (f) artificial development of gravel streambeds to provide spawning areas for anadromous fish, and (g) control of siltation in artificially developed spawning channels.
W73-13016

THE SENSITIVITY OF RETURN PERIODS TO VARIATIONS IN RETENTION LEVELS FOR DIFFERENT DEFINITIONS OF SHORTAGE,
Lancaster Univ., Bailrigg (England).
For primary bibliographic entry see Field 04A.
W73-13162

PRODUCTIVITY OF TALL WHEATGRASS AND GREAT BASIN WILDRYE UNDER IRRIGATION ON A GREASEWOOD-RABBITBRUSH RANGE SITE,
Agricultural Research Service, Reno, Nev. Plant Science Research Div.
R. E. Eckert, Jr., A. D. Bruner, and G. J. Klomp.
Journal of Range Management, Vol 26, No 4, p 286-288, July 1973. 2 tab, 7 ref.

Descriptors: *Phreatophytes, *Forage grasses, *Wheatgrass, *Productivity, *Nevada, Rabbitbrush, Ranges, Crop production, Crop response, Planting management, Seeds, Spring, *Sprinkler irrigation, Irrigation practices, Longevity, Soil chemical properties, Soil physical properties, Root development, Root distribution, Plant growth, Saline soils, Sodic soils.
Identifiers: *Humboldt River Basin (Nev), Greasewood (Sarcobatus vermiculatus), Wild rye grass, Sodic soils.

In the Humboldt River Basin of northern Nevada, the replacement of some 394,000 acres of greasewood and rubber rabbitbrush with forage plants of high economic value would salvage a large portion of the 103,000 acre feet of water estimated to be used yearly by those non-beneficial phreatophytes. In this study tall wheatgrass and Great Basin wildrye were springseeded on the range site and established by sprinkler irrigation. An evaluation of the longevity and productivity of these seeded species under different irrigation regimes was made and showed that weekly irrigations for 2-3 years were required to establish potentially productive stands of the seeded species. The highest production of tall wheatgrass and Great Basin wildrye was obtained 3 years after seeding with weekly irrigations of 1.25 inches of water, the wheatgrass being the more productive. Productivity with limited water or without water was reduced by the chemical properties of the saline-sodic soil, while root growth was restricted by the physical characteristics of the soil. (Gloyd-Arizona)
W73-13314

3C. Use of Water of Impaired Quality

SALINITY AND DRAINAGE IN A BROWN CHERNOZEM IRRIGATED AT DIFFERENT MINIMUM MOISTURE CONTENTS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
K. K. Krogman, and E. H. Hobbs.
Can J Soil Sci. Vol 52, No 3, p 359-364. 1972. Illus.
Identifiers: *Brown chernozem, Crop yields, *Drainage, Evapo-transpiration, Irrigation, Moisture, *Salinity, Transpiration.

The salinity of a brown chernozem under 4 irrigation regimes was measured at the beginning and end of each of 2 cycles of a 4-yr crop rotation. Irrigation reduced soil salinity during the first cycle and maintained it at the reduced level during the second cycle. Drainage in 4 yr, calculated on the basis of salt balances, increased proportionately to irrigation plus rainfall. Where only enough water was applied to maximize crop yields, that is, where soil moisture was maintained within the upper half of the available range, about 95% of the irrigation plus rainfall was utilized by the crops through evapotranspiration. Under this regime, maximum crop yields and an adequately low level of soil salinity were maintained.--Copyright 1973, Biological Abstracts, Inc.
W73-13109

STUDIES ON SODIUM WATER FOR IRRIGATION. EFFECT OF ADDITION OF CATIONS: K, CA OR MG,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
B. K. Sinha, and G. Dev.
J Res Punjab Agric Univ. Vol 9, No 1, p 40-49. 1972.
Identifiers: *Berseem, Calcium, Cations, Growth, Irrigation, Magnesium, Potassium, *Sodium water, Crop yield.

A greenhouse experiment was conducted on a loamy-sand soil to study the effect of irrigation water, containing 2 concentrations of Na, on berseem, as influenced by the presence of K, Ca or Mg. The use of Na water (12.8 me/l Na) drastically reduced the yield of berseem by affecting plant survival and growth, and resulted in an increased concentration of Na in the plants; the K content in plants decreased and the quality of the produce in terms of N content also deteriorated. The addition of K or Ca tended to offset the damaging effects of Na, both for the yield and the content of N in berseem. This effect of cations was evident at a lower concentration of Na in water (12.8 me/l).--Copyright 1973, Biological Abstracts, Inc.
W73-13192

SALT PICKUP FROM AGRICULTURAL LANDS IN THE GRAND VALLEY OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-13202

PHYSICAL PROBLEMS AND THEIR AMELIORATION IN SALTY SOILS,
Department of Overseas Trade, Canberra (Australia). Trade Commissioner Service.
For primary bibliographic entry see Field 02G.
W73-13308

PEDOGENIC CALCITE ACCUMULATION IN ARID AND SEMIARID REGIONS OF THE INDO-GANGETIC ALLUVIAL PLAIN OF ERST--WHILE PUNJAB (INDIA)--THEIR MORPHOLOGY AND ORIGIN,
Ghent Rijksuniversiteit (Belgium). Geologisch Instituut.
For primary bibliographic entry see Field 02G.
W73-13311

EFFECT OF WASTE WATER FROM THE ASTRAKHAN CELLULOSE-PASTEBOARD PLANT ON SOIL PROPERTIES,
For primary bibliographic entry see Field 05D.
W73-13315

PLANT INDUCED SOIL SALINITY PATTERNS IN TWO SALTBUSH (ATRIPLEX SPP.) COMMUNITIES,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Rivernina Lab.
M. L. Sharma, and D. J. Tongway.
Journal of Range Management, Vol 26, No 2, p 121-125, March 1973. 3 fig, 5 tab, 9 ref.

Descriptors: *Saline soils, *Plant growth, *Salt tolerance, *Soil-water-plant relationships, On-site investigations, Soil surveys, Decomposing organic matter, Leaching, Precipitation (Atmospheric), Evaporation, Water utilization, Saltation, Semiarid climates.
Identifiers: *Saltbush.

Atriplex vesicaria and A. nummularia were examined on two soil types. Both saltbush species induced significantly higher salinity in the 0-15 cm soil horizon beneath the bush canopies compared to between the bushes. Salinity level on only surface layers (0-7.5 to 15 cm) fluctuated with season; the salinity was highest during and after summer when the evaporative demands were high, and lowest during winter after rains. The contribution of salinity from the water table was examined and discounted as a highly doubtful source. It is hypothesized that salt accumulation, depletion, and compensation are a net result of processes which accumulate salts at one position and those which deplete them from the other. These processes include plant litter fall and its decomposition; leaching of salts from plants with rain, along with leaching in the soil profile; evaporation of water from soil surface and deposition of salts at the soil surface; water movement to plant roots and convectional transport of salts, including salt transport by ionic diffusion. (Bahre-Arizona)
W73-13316

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN FLOW,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 05G.
W73-13469

3D. Conservation in Domestic and Municipal Use

INSTITUTIONAL REQUIREMENTS FOR OPTIMAL WATER QUALITY MANAGEMENT IN ARID URBAN AREAS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-13002

EVALUATION OF DISCONTINUITIES IN REGIONAL POPULATION PROJECTIONS,
Massachusetts Univ., Amherst. Dept. of Sociology.
For primary bibliographic entry see Field 06B.
W73-13006

ATTITUDES, VALUES, AND PERCEPTIONS IN WATER RESOURCE DECISION-MAKING WITHIN A METROPOLITAN AREA,
Massachusetts Univ., Boston. Dept. of Political Science.
For primary bibliographic entry see Field 06B.
W73-13008

HYDRA: DYNAMIC MODEL FOR URBAN HYDROLOGIC SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 04A.
W73-13012

REGIONAL WATER RESOURCE PLANNING FOR URBAN NEEDS: PART II (APPENDICES),
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06A.
W73-13015

METHODOLOGY FOR ASSESSMENT OF URBAN WATER PLANNING OBJECTIVES,
Texas A and M Univ., College Station. Water Resources Inst.
W. L. Meier, and B. M. Thornton.
Technical Report No 51, June 1973, 158 p, 33 fig, 6 tab, 98 ref.

Descriptors: Planning, *City planning, *Decision making, *Alternative planning, *Texas, *Urbanization, Water management (Applied), Water demand, Water utilization, Water quality standards, Local governments.
Identifiers: *San Antonio River (Tex), Objective setting procedure, *Planning procedures.

One of the most perplexing problems in the United States is concerned with providing the public services required in rapidly-expanding urban areas. This problem involves the development, use, and management of water resources. In order to allocate the available physical and economic resources, water resource planners have concentrated on developing planning techniques to meet these allocation problems. Significant gains have been made by the application of systems analysis and operations reasearch, but little attention has been directed in the past towards the development of procedures for the formulation of objectives in water resource planning. This research is concerned with the study of urban water planning objectives in the San Antonio, Texas area. Specific goals were set and researched. Then, the procedure was applied to a realistic problem encountered by the San Antonio, Texas metropolitan area. The study indicates how other such procedures can be generated, depending on the planning environment and the problems at hand. The major conclusions are (1) urban water planning will continue to be a complicated, yet indispensible, process for urban water management; (2) the objective setting is an important phase of the planning process, (3) there is a need for a stated procedure on how to assess urban water planning objectives, and (4) the procedure can be applicable to any area concerned with water planning objectives by water resource planning agencies. (Runkles-Texas)
W73-13017

A PROCEDURE FOR ASSESSING WATER RESOURCES FOR URBAN PLANNING,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06A
W73-13035

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN NORTHERN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 06D.
W73-13042

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05D.
W73-13156

3E. Conservation in Industry

AQUATIC ORGANISMS AND HEAVY METALS IN MISSOURI'S NEW LEAD BELT,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05C.
W73-13037

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN NORTHERN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 06D.
W73-13042

GEOTHERMAL ENERGY--RESOURCES. PRODUCTION, STIMULATION.
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W73-13214

INTRODUCTION: THE ENERGY OUTLOOK,
Union Oil Co. of California. Los Angeles.
For primary bibliographic entry see Field 06D.
W73-13215

WORLDWIDE STATUS OF GEOTHERMAL RESOURCES DEVELOPMENT,
California Div. of Mines and Geology, Sacramento.
For primary bibliographic entry see Field 06D.
W73-13216

ASSESSMENT OF U.S. GEOTHERMAL RESOURCES,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 06D.
W73-13217

CHARACTERISTICS OF GEOTHERMAL RESOURCES,
Geological Survey, Menlo Park, Calif.
D. E. White.
In: Geothermal Energy--Resources, Production Stimulation; Proceedings of Special Symposium o

American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 69-94, 1973. 4 fig, 1 tab, 50 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Power demand.

The major known geothermal systems of the world and the existing capacity of the major producing fields are summarized. Hydrothermal--convention systems, whether dominated by vapor or by hot water, are generally associated with tectonic plate boundaries and volcanic activity. In hydrothermal-convention systems most heat is transferred in circulating fluids rather than by conduction. Hot water systems are characterized by liquid water as the continuous, pressure-controlling fluid phase. A few geothermal systems, including the important Larderello fields of Italy and The Geysers of California, produce dry or superheated steam with no associated liquid. Liquid water and vapor normally coexist in the reservoirs with vapor as the continuous, pressure-controlling phase. One or more of several potentially important breakthroughs in technology may greatly expand the development of dry and low-temperature geothermal systems. Heat-exchange technology would permit utilizing the heat from fluids down to 100 deg C or less. Multipurpose developments, including desalination and chemical recovery, would yield significant sharing of total costs. Low cost mechanical, chemical, or nuclear fracturing of hot, dry rocks would increase permeability, thus permitting introduction of fluids and recovery of stored energy. (See also W73-13214) (Knapp-USGS)
W73-13218

EXPLORATIONS FOR GEOTHERMAL RESOURCES,
California Univ., Riverside. Dept. of Geological Sciences; and California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
J. Combs, and L. J. P. Muffler.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 95-128, 1973. 15 fig, 81 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, *Exploration, Subsurface investigations, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Power demand.

The methods available for the exploration, discovery, and delineation of economic reservoirs of geothermal energy are reviewed. The objectives of geothermal exploration ventures are to locate areas underlain by hot rock, to estimate the volume, temperature, and permeability at depth, to predict whether wells will produce dry steam or a mixture of water and steam, and to predict the chemical composition of the produced fluid. The following steps, or phases, each successively more sophisticated and/or expensive are suggested: literature search, airborne survey, geologic and hydrologic survey, geochemical survey, geophysical survey, and drilling. (See also W73-13214) (Knapp-USGS)
W73-13219

STEAM PRODUCTION AT THE GEYSERS GEOTHERMAL FIELD,
Union Oil Co. of California, Cloverdale. Big Geysers Station.
C. F. Budd, Jr.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 129-144, 1973. 7 fig, 5 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells, *California.
Identifiers: *Geothermal power, *Power demand, *Geysers geothermal field (Calif).

At the Geysers in northern Sonoma County, California, the dominant phase of water is gaseous steam, a condition existing in only a few major commercially producing fields in the world, including the Larderello field in Italy and the Matsukawa field in Japan. A constant rate of production cannot be sustained. Individual wells have declined in production, and additional wells have been required to maintain the supply of steam to the generating units. This has been the experience at the Larderello field as well, where continued drilling is required to maintain a constant generating capacity of 365 Mw. Pressure depletion in the reservoir is a factor in the production decline, and field-wide static reservoir-pressure surveys have confirmed this suggestion. A typical wellhead and pipeline configuration with the blowdown tee, centrifugal separator, meter run, and dirt-leg is shown. The utility's powerplant liquid effluent constitutes about 25% of the total condensed steam throughout, the remainder being evaporated in the cooling towers. This effluent contains most of the water-soluble constituents of the steam and cannot be discharged into surface waters which are drawn upon for domestic and agricultural use. It is therefore reinjected into the steam formation through injection wells. (See also W73-13214) (Knapp-USGS)
W73-13220

DESIGN AND OPERATION OF THE GEYSERS POWER PLANT,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 08C.
W73-13221

THE VAPOR-TURBINE CYCLE FOR GEOTHERMAL POWER GENERATION,
For primary bibliographic entry see Field 08C.
W73-13222

ENVIRONMENTAL IMPACT OF GEOTHERMAL DEVELOPMENT,
Oregon State Dept. of Geology and Mineral Industries, Portland.
For primary bibliographic entry see Field 06G.
W73-13224

RECOVERY OF GEOTHERMAL ENERGY FROM HOT, DRY ROCK WITH NUCLEAR EXPLOSIVES,
Battelle-Northwest, Richland, Wash. Geothermal Programs.
For primary bibliographic entry see Field 08H.
W73-13226

EXPLOSIVE STIMULATION OF HYDROTHERMAL RESERVOIRS,
Stanford Univ., Calif. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 08H.
W73-13227

GEOTHERMAL RESOURCES RESEARCH,
National Science Foundation, Washington, D.C. Div. of Advanced Technology Applications.
For primary bibliographic entry see Field 06D.
W73-13232

HEAT RECOVERY IN PROCESS PLANTS,
Struthers Wells Corp., Warren, Pa.
For primary bibliographic entry see Field 05D.
W73-13431

GEOTHERMAL POWER STILL IFFY,
G. Weismantel.
Chemical Engineering, Vol 80, No 6, p 40-41, March 5, 1973. 2 fig.

Descriptors: *Thermal power plants, *Geothermal studies, *Brines, *Steam, *Design, Efficiencies, Electric power production, Geology, Heat flow, Temperature, Brine disposal, Drilling, Trace elements, Costs, Environmental effects, Evaluation, Performance.
Identifiers: *Mexico (Cerro Prieto), Magmamax process.

Interest in the possibility of geothermal-based power units has grown in the face of the U.S.'s rising fuel and power shortage. During 1972, electricity has flowed from geothermal power units in Cerro Prieto, Mexico; the Magmamax process of Magma Power Company has found a sponsor; and a test facility for electricity and pure water production has been developed by Envirogenics Company. These three systems tap into earth-locked hot brine which is about 500 F, to flash off steam to run turbines. The cycle efficiency of the Cerro Prieto facility is about 10-15%, but is expected to grow to about 30% with more diversified use of the geothermal energy. Envirogenics believes 22-30% efficiency can be achieved with its dual purpose process. The corrosive properties of brine increase equipment costs and the presence of trace materials threatens the biological community in recipient streams. Some problems may be by-passed with the development of a helical screw expander which is now being tested. The cost of electricity of the Cerro Prieto facility is $350/kw not including brine disposal and air pollution control. This may not be low enough to compete with nuclear or oil fire generators. (Jerome - Vanderbilt)
W73-13433

PREOPERATIONAL CLEANING OF HIGH PRESSURE STEAM SYSTEMS,
Black and Veatch, Kansas City, Mo.
T. C. Hoppe, and J. G. Parmley.
Industrial Water Engineering, p. 25-28, March/April 1973.

Descriptors: *Steam, *Industrial plants, *Operation and maintenance, *Cleaning, Thermal water, Electric power production, Facilities, Equipment, Maintenance, Installation, Maintenance costs, Reliability, Specifications, Methodology, Testing procedures, Storage requirements, Abrasive blasting, Detergents.
Identifiers: Pre-operation treatment.

The preoperation cleaning of steam systems is necessary to insure efficient operation and maintenance of the system. During construction and tests steps should be taken to prevent corrosion or visible gross material inadvertently remaining in the system after erection. Cycle components should be shop-coated with corrosion inhibitors and in hydrostatic testing only treated demineralized water should be used. The three basic steps in preoperational cleaning consist of : (1) water flushing to physically remove dirt and siliceous materials; (2) hot alkaline detergent washing to remove oils and grease; (3) hot acid cleaning to solubilize mill scale and remove residual silica from surfaces that have not been pre-blasted. The major consequences of improper preoperational quality control are discussed. These include oil build-up, tube failure due to improper storage, and poor feed water quality due to improper flushing. It is suggested that pre-boiler systems be acid-cleaned following the hot detergent wash, and although the initial cost of alkaline detergent cleaning is high it is economical in the long run. (Jerome-Vanderbilt)
W73-13444

TEMPERATURE PROFILES IN CONDENSERS,
Oklahoma State Univ., Stillwater.
K. J. Bell.
Chemical Engineering Progress, Vol 68, No 7, p. 81-82, July 1972. 1 fig.

Descriptors: *Condensers, *Steam, *Temperature, *Cooling, Water quality control, Water cooling, Equipment, Heat exchangers, Condensation, Boilers, Mathematical models, Model studies, Profiles.

Some configurations of process condensers with integral desuperheating and/or subcooling are examined and analyzed. To determine whether or not condensation will occur on a cold surface exposed to superheated vapor it should be assumed that heat is transferred from the superheated vapor by sensible heat transfer. An equation for this situation is presented in which it is seen that if the temperature on the vapor side is greater than the condensing or saturation temperature, condensation will occur. The limited available information indicates that the heat transfer coefficient for condensation directly from superheated vapor is within a few percent of that for condensation from saturated vapor. It is simpler to assume that condensation will occur directly from the superheated vapor, using the saturation temperature and a condensing heat transfer coefficient in the rate equation, and including the sensible heat in the heat load. Where moderate subcooling is required, it may be desirable to provide a region in the shell where condensate may exchange heat with the coolant entering. (Jerome-Vanderbilt)
W73-13445

HEAT-TRANSFER AGENTS FOR HIGH-TEMPERATURE SYSTEMS,
General Electric Corporate Research and Development, Schenectady, N.Y.
For primary bibliographic entry see Field 08C.
W73-13446

TREATMENT OF RADIOACTIVE STEAM--GENERATOR BLOWDOWN,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 05D.
W73-13447

WATER TREATMENT FOR HEATING AND PROCESS STEAM BOILERS,
For primary bibliographic entry see Field 05F.
W73-13462

EFFECT OF NONCONDENSABLES IN SEA WATER EVAPORATORS,
Burns and Roe Construction Corp., Chula Vista, Calif.
R. A. Khan.
Chemical Engineering Progress, Vol 68, No 7, p 79-80, July 1972. 1 fig.

Descriptors: *Condensers, *Sea water, *Evaporators, *Heat transfer, Evaporation control, Design, Model studies, Water cooling, Experimental models, Mathematical models, Evaluation, Transmissivity.
Identifiers: *Noncondensables.

The presence of noncondensables in vapor condensers reduces heat transfer and causes gas binding. To remove non-condensables, a vent stream is withdrawn at the last tube row in the bundle. A vertical tube evaporator was built to obtain the minimum amount of vent stream. Results indicate that the vent rate is important in maintaining the bundle heat transfer coefficient at low noncondensable levels. The minimum vent rate is much higher than the amount of noncondensable present because a minimum vapor velocity is necessary for effective sweeping of the noncondensable through the tube bundle. Tests at high noncondensable loading indicate the vent rate is important in maintaining bundle heat transfer coefficients. Tests do not indicate any gross noncondensable stratification in the vertical shell. An empirical model for the loss of heat transfer coefficient due to noncondensable film resistance can be used as a rough guide for predicting the local bundle coefficients. (Jerome - Vanderbilt)
W73-13463

NOMOGRAMS SIMPLIFY DESIGN OF STEAM CONDENSERS,
For primary bibliographic entry see Field 08C.
W73-13464

REQUISITES FOR NON-POLLUTING MICROBICIDES,
For primary bibliographic entry see Field 05D.
W73-13476

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX M--POWER.
Federal Power Commission, Chicago, Ill.
For primary bibliographic entry see Field 06B.
W73-13493

WATER REQUIREMENTS OF THE PETROLEUM REFINING INDUSTRY,
Maryland Univ., College Park.
L. E. Otts, Jr.
Geological Survey Water Supply Paper 1330-G, p 287-340, 1963.

Descriptors: *Water supply, Cooling, *Industrial water, Surveys, *Water requirements, Chemical reactions, Polymers, Planning.
Identifiers: *Petroleum industry, Cracking (Petroleum), Refineries, *Recirculation.

About 3,500 million gallons of water was withdrawn daily in 1955 for use by petroleum refineries in the United States. This was about 3 percent of the estimated daily withdrawal of industrial water in the United States in 1955. Ninety-one percent of the water requirements of the petroleum refineries surveyed was for cooling. One-third of the refineries reused their cooling water from 10 to more than 50 times. Only 17 refineries used once-through cooling systems. Refineries with recirculating cooling systems circulated about twice as much cooling water but needed about 25 times less makeup; however, they consumed about 24 times more water per barrel of charge than refineries using once-through cooling systems. The average noncracking refinery used about 375 gallons of water per barrel of crude, which is less than the 471-gallon average of refineries with cracking facilities. Refinery-owned sources of water supplied 95 percent of the makeup-water requirements. Surface-water sources provided 86 percent of the makeup-water demand. Less than 1 percent of the makeup water was obtained from reprocessed municipal sewage. (Campbell-NWWA)
W73-13561

3F. Conservation in Agriculture

HIGH-LIFT PUMPING AND THE IMPACT UPON ECONOMIC DEVELOPMENT OF DESERT LAND IN IDAHO,
Idaho Univ., Moscow. Dept. of Agriculture.
K. H. Lindeborg.
Idaho University Water Resources Research Institute Research Project Technical Completion Report, December 1970. 8 p, 1 fig, 1 tab, 3 ref. OWRR-A-002-IDA (1).

Descriptors: Water resources development, *Land development, *Irrigation, *Deserts, *Idaho, Imported water, Agriculture, Costs, Economics, Model studies, Evaluation.
Identifiers: *Nampa (Idaho).

This study was conducted in the Dry Lake area at Nampa, Idaho, where companies are pumping irrigation water from the Snake River to a plateau 500 to 600 feet above the river surface. Data was secured for 8 farms by interviewing each farm operator and land owner. To make comparisons between farms and also between enterprises, the data were broken down into per acre variable costs, fixed costs, total returns, net income, and the cost of producing a dollar's worth of output. The budgeting method of esumating water values in irrigation was used. Long-run planning cost curves were estimated from the budgets by using curvilinear regression. From the regression equations for each of the four enterprises (grain, sugar beets, potatoes, and alfalfa seed), 12 model farms were constructed. The long-run average total cost curve for the model farms, which incorporates a long-run rotation and long-run price and yield expectations, indicated economies of farm size of up to 2,400 acres. Net income, the measurement of how much money is left over to pay for irrigation water after all expenses (including remuneration for management, land, and investment) have been paid, varied from about $50.00 to $57.00 per acre for all model farms. (Woodard-USGS)
W73-13027

WATER AND LAND RESOURCES IN EDEN VALLEY, WYOMING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
T. L. Hall, and J. H. Taylor.
Completion Report, February 1973. 180 p, 26 fig, 83 tab, 16 ref, 3 append. OWRR B-043-COLO (10).

Descriptors: *Water resources, *Land resources, *Land use, *Hydrologic budget, *Wyoming, Irrigation, Crops, Phreatophytes, Evapotranspiration, Water balance, Water quality, Water management (Applied), Consumptive use, Groundwater, Hydrogeology, Aquifer characteristics, Surface waters.
Identifiers: *Eden Valley (Wyo).

An inventory of existing information on land and water resources was made for Eden Valley, Wyoming. Much of the data came from existing reports of the United States Bureau of Reclamation. Some data were obtained from the University of Wyoming on irrigation efficiency studies conducted in Eden Valley. Land use data were concerned with the crops and phreatophytes in the valley in order that the consumptive use requirement could be computed. Being able to compute evapotranspiration allowed water budgets to be prepared for the 1963-1969 water years. A summary of mean monthly and mean annual water budget is reported. (Woodard-USGS)
W73-13044

THE EFFECT OF WATER AND SALT FLUXES ON THE TRANSROOT POTENTIAL IN HELIANTHUS ANNUUS,
Atomic Energy Agricultural Research Center, Tando Jam (Pakistan).
For primary bibliographic entry see Field 02I.
W73-13066

STUDIES ON THE SOIL-WATER SYSTEM IN THE FIELD: II. STATISTICAL CONSIDERATION ON THE SOIL MOISTURE CONTENT (IN JAPANESE),
Utsunomiya Univ., Tochigi (Japan). Coll. of Agriculture.
For primary bibliographic entry see Field 02G.
W73-13091

RICE SEEDLINGS GERMINATED IN WATER WITH NORMAL AND IMPEDED ENVIRONMENTAL GAS EXCHANGE,
Birmingham Univ. (England). Dept. of Botany.
H. A. Kordan.
J Appl Ecol. Vol 9, No 2, p 527-533, 1972. Illus.

Identifiers: Environmental studies, Gas exchange, *Rice seedlings, Water-atmosphere interfaces, *Germination (Rice).

Marked differences in growth and developmental phenomena became evident in rice seedlings germinated in water when the normal gas exchange between the water and the atmosphere above was impeded. Normal growth and development of the seedlings were suspended during prolonged exposure of the plants to the aqueous medium where the normal environmental gas exchange was hindered. Provided that the seedlings were not severely damaged by microbial activity, normal growth and development of the plants were resumed when the normal gas exchange between the aquatic environment and the atmosphere above was restored.--Copyright 1973, Biological Abstracts, Inc.
W73-13092

COMPEITTION BETWEEN GRASS AND CLOVER FOR PHOSPHATE: II. EFFECT OF ROOT ACTIVITY, EFFICIENCY OF RESPONSE TO PHOSPHATE, AND SOIL MOISTURE,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Grassland Div.
R. H. Jackman, and M. C. H. Mouat.
N Z J Agric Res. Vol 15, No 4, p 667-675, 1972. Illus.
Identifiers: Agrostis-Tenuis, *Clover, *Grass, *Phosphates, *Root systems, Soil moisture, Trifolium-Repens.

Factors studied were the relative root activities for P uptake by white clover (Trifolium repens L.) and browntop (Agrostis tenuis Sibth) at different depths in the soil, the root tip numbers per unit volume of soil, the loss of soil moisture caused by the presence of browntop, and the response curves of white clover and browntop to applied P. Grass and clover roots can directly compete for P in the top 2.5 cm of top dressed soil, the grass can decrease the availability of P by increasing soil moisture tension, and both these results will affect white clover more adversely than browntop, because of the markedly less efficient response to applied P of clover than of browntop. This result will be most strongly expressed in soils which strongly fix P and easily develop high moisture tension.--Copyright 1973, Biological Abstracts, Inc.
W73-13097

INFLUENCE OF SURFACE SOIL CONDITIONS ON DRYING IN EARLY SPRING,
Macdonald Coll., Montreal (Quebec). Dept. of Soil Science.
M. M. Iqbal, and B. P. Warkentin.
Can J Soil Sci. Vol 52, No 3, p 449-456, 1972.
Identifiers: Bulk, Density, *Drying, *Hydraulic conductivity, *Soils (Plowed and unplowed), Spring.

Changes in water content of adjacent plowed and unplowed surface soils were measured in early spring in the field. The plowed plots on sand and clay soils lost more water than unplowed plots. The major decrease in water content of the clay soil was in the 0-7-cm layer, whereas the sand lost as much water from the 7-15-cm layer as from the 0-7-cm layer. The medium-grained soil showed greater drying from the unplowed than from the plowed surface. The higher bulk density of this soil may account for this observation. Differences in net radiation measured above plowed and unplowed surfaces were too small to account for the measured differences in water loss. There was evidence that the drier surface was due to lower hydraulic conductivity of the plowed surface, but increased turbulent transfer from the rougher surface could also be involved.--Copyright 1973, Biological Abstracts, Inc.
W73-13098

LOSSES OF ATRAZINE IN RUNOFF WATER AND SOIL SEDIMENT,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 05B.
W73-13102

PESTICIDES, POLLUTION, AND FOOD SUPPLY,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
For primary bibliographic entry see Field 05G.
W73-13104

EFFECT OF WATER REGIME ON THE SUCROSE-ENZYME RELATIONSHIPS OF SUGARCANE DESSICATED WITH PARAQUAT,
Puerto Rico Univ., Mayaguez. Agricultural Experiment Station.
R. Montalvo-Zapata, and A. G. Alexander.
J Agric Univ P R. Vol 56, No 2, p 134-153. Illus. 1972.
Identifiers: Enzymes, Herbicides, *Paraquat, *Sucrose-enzyme relations, *Sugarcane, Water regime.

Immature sugarcane was given variable-water regimes in sand culture and subsequently treated with a powerful desiccant, the bipyridylium herbicide Paraquat, applied as a 0.05 percent aqueous foliar spray. The objectives were to evaluate the effects of water regime on sucrose-enzyme relationships in desiccating sugarcane, and to determine whether controlled water regimes could effectively modify Paraquat activity in sugarcane. Tissue samples were harvested for moisture, sugar and enzyme analyses at 1, 3 and 9 days after Paraquat application. Low water supply (1 liter/day) reduced total fresh weights and stalk weights, and increased sucrose content of immature storage tissue. Paraquat significantly lowered total fresh weights, stalk weights, sheath moisture and leaf sucrose by the 9-day harvest. Desiccant action was generally more rapid within the low-water regime. High- and intermediate-water regimes tended to modify Paraquat activity at 1 or 3 days, but its ultimate effects were comparable regardless of water regime. No evidence was found to support the theory that deisccating cane accumulates water as a function of continued water absorption when transpiration has ceased. Acid invertase was suppressed by Paraquat. The suppression was most severe in the low-water regime. Low-water supply significantly lowered invertase level but the response was not consistent at all harvests. Acid phosphatase and ATPase were severely repressed by Paraquat in leaves but not in immature storage tissue. An explanation was offered in terms of distinct chloroplast and mitochondrial enzymes rather than localized Paraquat action. For both enzymes the desiccant repression was significantly more severe in the high-water regime at 1 or 3 days, but water regime showed no effect at 9 days. Paraquat significantly increased beta-amylase in leaves particularly within the high-water regime. In immature stem tissue beta-amylase was repressed by high water in Paraquat-free plants. Paraquat eliminated the water effect. Peroxidase was increased in storage tissue by Paraquat. This response was statistically significant only under conditions of low-water supply. Variable water regimes can modify the rate of initial Paraquat activity in sugarcane; however, the ultimate effects of Paraquat will not be changed under conditions of thorough chemical application. Under field conditions of marginal chemical penetration, the plant's moisture status might play a more decisive role in determining the desiccant's effectiveness.--Copyright 1973, Biological Abstracts, Inc.
W73-13114

PHOSPHATE MOVEMENT FROM AN AGRICULTURAL WATERSHED DURING TWO RAINFALL PERIODS,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W73-13115

WATER LOSS FROM CUT GRASS WITH SPECIAL REFERENCE TO HAY-MAKING,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
Y. Leshem, R. Thaine, C. E. Harris, and R. J. Canaway.
Ann Appl Biol. Vol 72, No 1, p 89-104. 1972. Illus.
Identifiers: Air, Drying, *Grass, *Hay, Humidity, Petroleum vapor, Temperature, Tissue, Treatments, Vapor pressure, *Water loss.

An apparatus, used to measure water loss at 28 plus or minus 1C from blotting paper and from leaves and stem internodes of cocksfoot, consisted of 4 channels in which air speed was controlled at 25-80 cm/s and relative humidity at 7-68%. The maximum rate of water loss from wet blotting paper was 10,500 mg water/dm/hr but from leaves and stem internodes supplied with water it was less than 250 mg/dm/hr. The rate of loss from both plant specimens and blotting paper was linearly related to the vapor pressure differences between the specimen and the surrounding air but was not increased when air speed was changed from 40 to 80 cm/s. Grass specimens supplied with water had lower rates of water loss than wet blotting paper because of tissue resistances which were calculated for (a) untreated leaf and stem specimens, (b) rubbed leaves, (c) cut leaves, (d) leaves exposed to steam for 60 s. Treatments (b)- (d) greatly reduced tissue resistances. The rates of drying of leaves and stem internodes not supplied with water changed only slightly in response to faster air speeds but were significantly increased by treatments (b), (c), (c sub) (split stems), (d) and (e) (exposure to petroleum vapor for 60 S). The most effective treatments trebled the drying rates of leaves and increased the drying rates of stem internodes by 10 times. Reductions in relative humidity had little effect on drying rate following treatments (a), (b), (c) and (d), but when treatments (c sub) and (3) were given, additional significant increases in drying rates were obtained when the relative humidity was reduced. Grass specimens given the most effective treatments and dried under the most favorable conditions did not utilize the full drying capacity of the environment, for the rates of water loss from these specimens were at least 3 times lower than those from wet blotting paper. High rates of drying could apparently be achieved at 28C or similar temperatures if practical treatments were developed to remove or greatly reduce the high resistance to water loss in cut grass.--Copyright 1973, Biological Abstracts, Inc.
W73-13119

ECONOMIC SIGNIFICANCE OF DRY-LAND FARMING IN THE ARID NORTHERN NEGEV OF ISRAEL,
Israel Meteorological Service, Bet-Dagan. Div. of Agricultural Meteorology.
J. Lomas.
Agric. Meteorol. Vol 10, No 4/5, p 383-392. 1972. Illus.
Identifiers: Arid lands, *Dry-land farming, Economic farming, Irrigation, *Israel (Negev Desert), Rainfall, Wheat yield relationships, Statistical studies, *Wheat yield.

Under arid conditions rainfall-wheat yield relationships analyzed by means of simple and multiple regressions principal components and Fisher's orthogonal polynomial method all gave good results. Fisher's technique was then employed to estimate the effect on final yield of a unit change in rainfall. The response curve obtained was used to calculate wheat yields for a cross-section of the northern Negrev, where mean annual rainfall varies from 200-411 mm. A 20% profit margin can probably be obtained in 7 of every 10 yr only in an area where the mean annual rainfall is at least 300mm. Where rainfall is below 300 mm additional

irrigation is essential, for in an area of 240 mm 20% profit margins can only be obtained 3-4 times in every 10 yr. Under local climatic and soil conditions and agrotechnical practices the highest average yield response to irrigation is obtained during the first 40 days after planting.--Copyright 1973, Biological Abstracts, Inc.
W73-13121

INHERITANCE AND PHYSIOLOGICAL EFFECTS OF STOMATAL FREQUENCY IN BARLEY,
Funk Bros. Seed Co., Bloomington, Ill. Winter Wheat Research.
K. E. Miskin, D. C. Rasmusson, and D. N. Moss.
Crop Sci. Vol 12, No 6, p 780-783. 1972. Illus.
Identifiers: *Barley, Droughts, Hordeum-Vulgare, Inheritance, *Photosynthesis, Physiological effects, *Stomatal frequency, *Transpiration.

The inheritance of stomatal frequency in 5 barley (Hordeum vulgare L.), populations and the effect of stomatal frequency on photosynthesis, transpiration, and stomatal resistance to diffusion were studied. Barley lines high and low in stomatal frequency from 2 backcross populations were used. Heritabilities, estimated by the parent-progeny regression method, ranged from 22 to 74%. These estimates were for the F2 and F3 generations on the individual plant basis. Realized heritabilities based on simulated high and low selection were in good agreement with the regression estimates, although the estimates were consistently higher for the high than for the low selection. For plants pretreated to assure open stomata, stomatal diffusive resistances and transpiration rates differed statistically among lines, but photosynthesis did not. Lines having low stomatal frequencies had higher stomatal resistances, and transpired less water than lines with more stomata. A 25% decrease in frequency of stomata reduced transpiration rates by about 24%. Stomatal frequency did not influence the rate of photosynthesis, however. The possibility exists of altering transpiration without altering photosynthesis by selecting varieties with fewer stomata.--Copyright 1973, Biological Abstracts, Inc.
W73-13125

CLIMATIC UNCERTAINTY EFFECTS ON MANAGEMENT AND DESIGN OF RESERVOIR-IRRIGATION SYSTEMS,
Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics.
N. J. Dudley.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 508-517, (1972). 1 fig, 8 ref.

Descriptors: *Reservoirs, *Irrigation projects, *Design, *Management, *Simulation analysis, *Dynamic programming, *Model studies, Optimization crops, Reliability, Water supply, Systems analysis, *Risks.
Identifiers: *Climatic uncertainty.

Before determining optimal levels of design variables for proposed water resource systems, one must optimize operational management for different design-variable combinations. In irrigation systems especially, such optimization is complicated by climatic uncertainty. Traditional project evaluation procedures use deterministic crop water requirements and the objective of a high level of reliability of water supply to farmers. Each of these may lead to sub-optimal designs in climatically-variable environments. Models developed to incorporate variable crop water use and obtain measures of expected net revenue-net revenue variance tradeoffs to aid in selecting optimal reliability levels are briefly reviewed. In the proposed project examined, both the expected value and variance of net revenue are very sensitive to changes in the reliability level. (See also W73-13134) (Bell-Cornell)
W73-13137

ESTIMATING BENEFITS TO IMPROVED SEASONAL WATER SUPPLY FORECASTS: A CASE STUDY OF IRRIGATION BENEFITS,
Battelle Memorial Inst., Columbus, Ohio.
J. L. Moore.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 610-628, (1972). 1 fig, 5 tab, 14 ref.

Descriptors: *Estimating, *Benefits, *Seasonal, *Water supply, *Forecasting, *Irrigation, *Linear programming, *Streamflow, Crops, Probability, Harvesting, Optimization, Acreage, Mathematical models, Systems analysis.
Identifiers: Error, Bayes' formula.

The approximate benefits to a typical irrigation area from improved seasonal streamflow forecasts are quantified using a probabilistic linear programming model. In this formulation, a two-period analysis is represented in which planting crops takes place on the basis of probabilistic predictions of the water supply necessary for growing and harvesting crops. The decision variable of interest is the change in acreages planted that may take place as the dispersion of forecast error is reduced. Seasonal streamflow forecasts give rise in theory to conditional probability distributions of observing various quantities of seasonal water supply. Hypothetical conditional probabilities are computed using Bayes' formula. Increase in accuracy is measured by using calculations of the conditional entropy of the probability distributions derived from the Bayes formulation. The model serves to allocate a region's crop acreages so as to maximize the expected income of planting associated with each forecast. Output includes expected income for each forecast and crop acreages planted based on each forecast. Results from testing the model indicate gross benefits ranging from a few cents per acre up to as much as $6.00 per acre. The results exhibit diminishing returns to successive increments of increased forecast accuracy. (See also W73-13141) (Bell-Cornell)
W73-13143

DRY FARMING: UNCERTAINTY IN LAND AND WATER PRODUCTIVITY,
Arizona Univ., Tucson.
O. Benassini, J. F. Bueno, and H. K. Qashu.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 884-902, (1972). 6 fig, 1 tab.

Descriptors: *Dry farming, *Land, *Productivity, Agriculture, Crops, Precipitation (Atmospheric), Probability, Resources development, Management, Technology, Irrigation, *Risks.
Identifiers: Gains, Penalties, Space-time distribution.

Productivity of land, water and human resources is a function of different interactive processes of varying complexity. Resource development and management planning implies knowledge of the system behavior and its production capacity. Three sets of production levels are recognized: (1) Current production levels under present practices; (2) potential production capacity through optimal use of present technology and small investments; and (3) potential production capacity through larger investments and development of water resources. A comprehensive system for comparing gains and penalties generated from additional and/or improved practices to increase productivity is presented. The proposed system recognized space-time distribution of rainfall, soil-crop allocation, crop ecology, and supplemental irrigation demands. (See also W73-13134) (Bell-Cornell)
W73-13160

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUES OF METHYLCARBAMATE INSECTICIDES IN CROPS AS THEIR 2,4--DINITROPHENYL ETHER DERIVATIVES,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 05A.
W73-13282

POTENTIAL EVAPORATION FROM PASTURE AND POTATOES AT ASPENDALE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 02D.
W73-13296

SOCIOLOGICAL CONSIDERATIONS IN IRRIGATION WATER MANAGEMENT: FACING PROBLEMS OF WATER QUALITY CONTROL,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 05G.
W73-13307

A COMPARATIVE STUDY OF SOIL VERSUS FOLLAR APPLICATION OF AMMONIUM NITRATE TO WHEAT UNDER DIFFERENT MOISTURE REGIMES,
Newe Yaar Experiment Station (Israel). Div. of Forage Crops and Pasture.
H. Nerson, and Z. Karchi.
Israel Journal of Agricultural Research, Vol 22, No 3, p 171-177, September 1972. 1 fig, 3 tab, 8 ref.

Descriptors: *Nutrient requirements, *Ammonium compounds, *Moisture availability, *Soil moisture, Wheat, Growth rates, Foliar application, Soil treatment, Water utilization, Semiarid climates, Cultivation, Nitrogen.
Identifiers: *Israel.

The effect of foliar and soil top-dressing of liquid ammonium nitrate, applied 5-7 days prior to heading of main culms, was studied under three different water regimes in a pot experiment. The effect of nitrogen treatments on dry matter accumulation was closely associated with the moisture level. The highest rate of growth was achieved by nitrogen treatment to pots kept at field capacity and the lowest rate by the same treatments kept at 30 percent available moisture. Foliar treatments induced an immediate effect on rate of growth, especially at the lowest moisture level, whereas, soil treatment tended to have a lasting effect on rate of growth, especially at the highest moisture level. Plant yield was significantly correlated with the number of tillers, spikes, and grains per plant. Soil application of nitrogen was more efficient than foliar application in increasing all of these parameters. Under semiarid conditions where moisture is limited, it might be desirable to seed populations having plant areas conducive to tillering, whereas under conditions where high plant density is practiced, and a good moisture supply is guaranteed, tillering would be undesirable. Application of foliar top dressing of ammonium nitrate would be more effective. (Bahre-Arizona)
W73-13313

SALT AND MEAL-SALT HELP DISTRIBUTE CATTLE USE ON SEMIDESERT RANGE,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
S. C. Martin, and D. E. Ward.
Journal of Range Management, Vol 26, No 2, p 94-97, March 1973. 3 fig, 1 tab, 9 ref.

Descriptors: *Arizona, *Salt tolerance, *Livestock, *Grazing, *Water requirements, Toxicity, Range management, Water demand, Forage grasses, Semiarid climates.
Identifiers: *Santa Rita Experimental Range (Ariz).

A study was conducted on the Santa Rita Experimental Range (near Tucson, Arizona), to determine whether salt or meal-salt mixtures were effective in improving distribution of grazing use, and whether livestock were affected detrimentally by placing either salt or meal-salt at remote locations on semidesert range. It was observed that placing salt away from water does not hurt cattle either by depriving them of adequate salt or by making them thirsty. Cows ate less than 1/2 lb/day of 3:1 meal-salt mix when it was fed 1 to 2 1/2 miles from water. No injury to cattle due to either inadequate or excessive salt was determined; however, low intake of supplement where mixtures contain as much as 25% salt may be a problem if fed far from water. The grazing distribution problem will not be solved by placement of salt or meal-salt alone, but in many cases, use on heavily grazed areas near water can reduce grazing damage only by appropriate periods of deferment or rest. (Bahre-Arizona)
W73-13317

NOTE ON THE INFILTRATION ADVANCE FRONT FROM BORDER IRRIGATION,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 02G.
W73-13371

ON THE INFLUENCE OF SODIUM ON THE WATER STATUS OF SUGAR BEET,
Akademiya Nauk SSSR, Ufa. Bashirskii Filial.
L. I. Sergeev, and F. S. Japparov.
Beit Trop Subtrop Landwirtsch Tropenveterinaer Med. Vol 8, No 4, p 303-308. 1970. Illus. English summary.
Identifiers: Fertilization, *Nitrates, *Sodium chloride, *Sugar beets, Sylvinite, Water status.

Effect of NaNO3, NaCl and sylvinite on the water-keeping capacity of leaves was studied, using the Arland wilting method. The water-keeping capacity was increased most (at an average of 14%) by adding NaCl. The sugar yield of soils poor in Na could be increased by 20-30% by means of Na salt fertilization.--Copyright 1973, Biological Abstracts, Inc.
W73-13393

DIFFERENTIAL STOMATAL RESPONSE BETWEEN C3 AND C4 SPECIES TO ATMOSPHERIC CO2 CONCENTRATION AND LIGHT,
National Inst. of Agricultural Sciences, Konosu (Japan). Dept. of Plant Physiology and Genetics.
For primary bibliographic entry see Field 02D.
W73-13398
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 05B.
W73-13416

WATER TREATMENT FOR HIGH PRESSURE BOILERS,
K. W. Herman, and L. R. Gelosa.
Power Engineering, Vol 75, No 5, p 64-66, May 1973. 4 fig.

Descriptors: Water treatment, *Boilers, *Boiler feedwater, *Corrosion, Water quality control, Heat transfer, Thermal water, Conduction, Pretreatment (Water), Mechanical engineering, Steam turbines, Hydrogen, Sludge, Filtration, Volatility, Water quality control.

Along with the problems high pressure boilers share with lower pressure boilers, they also have special difficulties. Overheating can result in gross ductile distortion and rupture of metal. Fluid film concentration results in dissolved solids being concentrated in a thin film of water when steam is formed and can cause deposits and corrosion. Diffusion of atomic hydrogen in the boiler metal produces methane gas resulting in blistering and cracking. Silica may volatilize in steam and cause deposits in turbines. The three main objectives of water treatment are to prevent scales, corrosion, and carryover. One treatment, called precision control is based on maintaining 2 to 4 ppm of phosphate and 15 to 50 ppm of hydrate alkalinity in the boiler to prevent calcium deposits and sludge buildup and to minimize silica volatilization. Coordinated phosphate pH control was developed to prevent caustic gouging. Volatile treatment uses hydrazine and neutralizing amines or ammonia. Purified water is also a means of preventing problems. (Jerome - Vanderbilt)
W73-13440

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1970-1971, SECOND ANNUAL ISSUE,
Colorado State Univ., Fort Collins. Dept of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-13472

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX N--AGRICULTURE.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-13494

RIGHTS TO NEBRASKA STREAMFLOWS: AN HISTORICAL OVERVIEW WITH RECOMMENDATIONS,
Nebraska Natural Resources Commission, Lincoln.
For primary bibliographic entry see Field 06E.
W73-13506

GRASS AND GRASS UTILIZATION IN ICELAND,
Agricultural Research Inst., Reykjavik (Iceland).
For primary bibliographic entry see Field 04A.
W73-13510

WATER STRESS IN 'TUROA' RED CLOVER UNDER 'AOTEA' WHEAT,
Lincoln Coll. (New Zealand). Dept. of Plant Science.
C. T. Dougherty.
N Z J Agric Res. Vol 15, No 4, p. 706-711. 1972.
Identifiers: Clover, Moisture, *Soil water stress, Trifilium-Pratense, Triticum-Aestivum, *Wheat (Aotea), *Red clover (Turoa), New Zealand.

Red clover (Trifolium pratense L. cv. 'Grasslands Turoa') established with wheat (Triticum aestivum L. cv. 'Aotea') in Canterbury was under considerable water stress during reproductive stages of development of the cereal, even when the soil water potential in the top 15 cm was approximately-1 bar. The unfavorable light and moisture environment of the red clover under wheat severely restricted root development to a few centimeters of the soil surface, where much less water was available than at greater depths.--Copyright 1973, Biological Abstracts, Inc.
W73-13527

PROPOSED CENTRAL ARIZONA PROJECT (FINAL ENVIRONMENTAL STATEMENT). AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS EIS-AZ-72-5-357-F1. BUREAU OF RECLAMATION, BOULDER CITY, NEVADA. (FES 72-35) SEPTEM BER 1972, 597 P. MAPS. 203 REF.
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 04A.
W73-13552

COMPLEX CHARACTERISTICS OF THE WATER-HOLDING CAPACITY OF PLANT TISSUES, (IN RUSSIAN),
M. M. Tyurina.
Bot Zh. Vol 57, No 4, p 509-521. 1972. Illus.
Identifiers: *Apple leaves, *Plant tissues, *Water storage (Plants).

The water holding potential of apple leaves of the 'Antonovka' and drought-resisting kind was investigated, using the methods of Shardavok and the Artsikhovskis with 2 mondifications. The method, utilizing polyethylene bags in hermetic chambers with calibrated papers convenient for mass experiments in place of solutions, is described. A discussion of other methods is included.--Copyright 1973, Biological Abstracts, Inc.
W73-13576

EFFECT OF TISSUE HYDRATION ON NITROGEN METABOLISM IN BARLEY LEAVES, (IN RUSSIAN),
Leningrad State Pedagogical Inst. (USSR).
N. N. Savitskaya.
Fiziol Rast. Vol 19, No 4, p 776-780. 1972. (English summary).
Identifiers: *Barley leaves, Drought, Hydration, Leaves, *Metabolism, *Nitrogen, *Tissue hydration (Plants).

The effect of drought on N metabolism was studied in barley leaves. The samples for analysis were taken after irrigation ceased and water deficiency in soil gradually increased. The total water content in leaf tissues was determined as well as protein and non-protein N. Changes in N metabolism consisted mainly in a decrease of the content of protein N. This reaction was found at the very early stages of dehydration when the total content of water slightly decreased. Dehydration resulted in water redistribution among the fractions and a decrease of the fraction of free water.--Copyright 1973, Biological Abstracts, Inc.
W73-13577

AGRICULTURAL CHARACTERISTICS OF THE BOTTOM LAND OF DNEPR RIVER, (IN BYELORUSSIAN),
M. F. Bakhar.
Vyestsi Akad Navuk B SSR Syer Biyal Navuk. 1. p 21-27. 1972.
Identifiers: *Agriculture, *Dneper River (USSR), Grass, Land, Marsh, Rivers, USSR.

Some results of a geobotanic study (1965-1970) of the plant bottom land of Dnepr from the Sozh Tributary to the Berezina Tributary (USSR) are given. The following 6 classes of plant formations were distinguished: true, settle, depleted, waste, moist meadow, and low-lying grass marsh. A total of 85 associations were found in them. Of 299 spp. recorded in the bottom land of Dnepr, 86 were poisonous plants; 36 of them were not previously recorded in White Russia-SSR (USSR).--Copyright 1973, Biological Abstracts, Inc.
W73-13578

EFFECT OF AWNS AND DROUGHT ON THE SUPPLY OF PHOTOSYNTHATE AND ITS DISTRIBUTION WITHIN WHEAT EARS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
L. T. Evans, J. Bingham, P. Jackson, and J. Sutherland.
Ann Appl Biol. Vol 70, No 1, p 67-76. 1972. Illus.

Identifiers: *Awns, Carbon assimilation, Distribution patterns, *Drought, Photosynthate, *Photosynthesis, *Wheat ears.

The presence of awns doubled the net photosynthetic rate of wheat ears and also increased the proportion of 14CO2 assimilated by the ear that moved to the grain. The effect of water supply on photosynthesis and movement of assimilates was greater for leaves than ears, so that drought increased the proportion of assimilate contributed by ear photosynthesis to grain filling 13%-24% in the awnless ears, and 34%-43% in the awned ears. 14C assimilated by the ears was most important to the economy of the upper spikelets and to the distal florets in each spikelet, whereas flag leaf assimilate went mainly to the spikelets in the lower half of the ear, and to the proximal florets. Awns increased grain yield in the dry but not in the irrigated treatment, despite the large contribution of awned ears to grain filling. Either the supply of assimilate did not limit grain yield when water supply was not limiting, or there were compensating disadvantages to awns. However, they did not seem to have any adverse effect on the development of the upper florets, nor did they reduce grain number per ear.--Copyright 1973, Biological Abstracts, Inc.
W73-13595

EFFECT ON WHEAT YIELD AND NITROGEN UPTAKE FROM MANURES MADE FROM SPENT-SLURRY,
R. D. Laura, and M. A. Idnani.
Plant Soil. Vol 37, No 2, p 283-295, 1972. Illus.
Identifiers: Decomposition, Flocculation, *Manures, Microbial studies, *Nitrogen, Peptizing reactions, Phosphates, *Slurry, Urea, *Wheat yield.

The use of liquid spent-slurry gave higher wheat yield and more N uptake than sun-dried slurry. The depressing effect of sun-drying on available N in slurry was attributed to enhanced irreversibility of the flocculative and peptizing reactions of organic colloidal matter due to desiccation and thus increased resistance to subsequent microbial decomposition and mineralization of slurry N. The absorption of liquid slurry in organic absorbents like green leaf powder, dry leaf powder, and sawdust greatly enhanced its manurial value. Its absorption in inorganic absorbents like charcoal dust and ash did not increase wheat yield, but N uptake was somewhat higher than sun-dried slurry. Like ordinary farm compost, the composts prepared by composting liquid slurry with wheat straw and sorghum stover gave lower yield and low N uptake. The enrichment of slurry with urea and superphosphate gave a manure which has a higher manurial value than (NH4)2SO4 on equivalent N basis.--Copyright 1973, Biological Abstracts, Inc.
W73-13601

AN EXPERIMENT DETERMINING THE TOTAL EVAPORATION FROM A FIELD OF A PLANNED IRRIGATION BLOCK OF LAND IN SOUTHERN MUGAN OF AZERBAIDZHAN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 02D.
W73-13605

EFFECT OF SUBSTRATE HUMIDITY CONDITIONS ON LETTUCE AND SPINACH MINERAL NUTRITION. 1. EFFECT OF HUMIDITY ON PLANT YIELD (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
G. Rinkis, and G. Paegle.
Latv Psr Zinat Akad Vestis. 11. p 22-28, 1971, Illus, English summary.
Identifiers: *Humidity (Substrate), *Lettuce, Mineral nutrition, Plant, *Spinach, Crop yield.

In 1 experiment lettuce plants were cultivated at 5 levels of constant substrate humidity: 20%, 35%, 50%, 65%, 80% of the total moisture capacity. In a second experiment, spinach plants were cultivated at first according to the same scheme, but on the 16th day the humidity was raised (from 20%-50%, from 50%-80%, from 20%-80%) or lowered (from 50%, from 80%-50%, from 80%-20%). The optimum humidity of substrate for lettuce and spinach under the conditions of experiment was 50%-65%. The minimum yield of lettuce was obtained at 80%, that of spinach at 20%.--Copyright 1973, Biological Abstracts, Inc.
W73-13635

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

HYDRA: DYNAMIC MODEL FOR URBAN HYDROLOGIC SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
A. J. Surkan.
Available from the National Technical Information Service as PB-222 486, $4.75 in paper copy, $1.45 in microfiche. Nebraska Water Resources Research Institute Project Completion Report, July 1973. 156 p, 13 fig, 2 tab, 4 ref, 4 append. OWRR B-016-NEB (2). 14-31-0001-3611.

Descriptors: Channels, *Computer models, Networks, Runoff, Routing, *Simulation analysis, *Urban hydrology, *Computer programs, *Storm runoff, Urban runoff, Rainfall runoff relationships.

The design and application are described of HYDRA, a new package of computer programs designed for the detailed modeling of the routing of water in converging channel networks. Geometric characteristics of intricate systems consisting of arbitrarily large numbers of channel segments can be considered. Accounted for in the simulation model are the relationships of the channel segments to each other, to surrounding areas, and to the rainfall variations and/or movement of storms. Storms are described as regions enclosed by boundaries approximated by any arbitrary number of polygon sides. The degree of detail with which either the network or storm patterns are defined may be chosen by the user. Results from this modeling package include, for finite storm events, the runoff rate and accumulated rainfall at any specified point on the network. With spatially uniform storms specificable as lengthy unevenly-sampled rainfall records, the result is a simulated continous streamflow record. In both cases, during the simulation there is a computation of several statistical estimators of the generated flow variations. The estimators computed include: mean time of arrival for the water, mean and variance of its flow rate, and the time and value of the flow rate maximum. The performance of the HYDRA package, in simulating the effect of uniform time-varying storms over an urban drainage network has been tested with ten sets of rainfall and runoff data from the Northwood area of Baltimore, Maryland. Comparisons of the simulated and observed runoff show excellent agreement using a model with only two or fewer parameters. The two scale parameters enter only as linear factors related to the overall system losses and travel times in the channels. Once they are known, the model is essentially parameter free and therefore is highly attractive for the simulation of flows at ungaged points of a network.
W73-13012

HIGH-LIFT PUMPING AND THE IMPACT UPON ECONOMIC DEVELOPMENT OF DESERT LAND IN IDAHO,
Idaho Univ., Moscow. Dept. of Agriculture
For primary bibliographic entry see Field 03F
W73-13027

SOME PROBLEMS IN STOCHASTIC HYDROLOGY,
Texas Univ., Austin. Center for Research in Water Resources
For primary bibliographic entry see Field 02A
W73-13039

PRELIMINARY STUDY OF POTENTIAL SITES FOR WATER-SUPPLY RESERVOIRS IN WEST AND SOUTHEAST ALABAMA,
Geological Survey of Alabama, University
For primary bibliographic entry see Field 06D
W73-13041

A DECADE OF JUDICIAL DEVELOPMENTS AND CHANGES IN COLORADO WATER LAW: 1960-1970,
Colorado State Univ., Fort Collins. Dept. of Economics
For primary bibliographic entry see Field 06E
W73-13070

A MINIMUM COST WATER DISTRIBUTION NETWORK,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
J. S. Hsu, and R. A. Deininger.
Research Report, UMICH-ENVSA-71-04, University of Michigan, School of Public Health, Ann Arbor, June 1971. 17 p, 6 fig, 2 ref, 1 append. OWRR-A-041-MICH (2).

Descriptors: *Water distribution (Applied), *Networks, *Linear programming, *Computer programs, *Algorithms, *Pipes, Size, Flow, Pressure, Data collections, Hydraulics, Mathematical models, Systems analysis.
Identifiers: *Cost minimization.

An algorithm and computer program which determine a least cost water distribution network are described. The network is assumed to be of a tree form and the algorithm used selects that combination of pipe sizes which minimize the total costs of the network while delivering the required flows at the required pressures at all points. The problem is formulated using linear programming. The computer program is written in FORTRAN IV, and is to be executed in batch mode under the MTS System of the University of Michigan. It consists of a main program and five sub-programs. Presented are: Deck set-up for batch users, a list of data input variables, control cards, the main program and its five sub-programs output. (See also W73-13072 and W73-13073) (Bell-Cornell)
W73-13071

DESIGN OF OPTIMAL WATER DISTRIBUTION NETWORKS USING DYNAMIC PROGRAMMING,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
L. C. Wu.
Research Report, UMICH-ENVSA-71-6, University of Michigan, School of Public Health, Ann Arbor, July 1971. 20 p, 2 fig, 1 tab, 1 append. OWRR-A-041-MICH (3).

Descriptors: *Dynamic programming, *Design, *Water distribution (Applied), *Networks, *Optimization, *Computer programs, *Pipes, Size, Annual, Capital costs, Constraints, Decision making, Project planning, Alternative planning, Hazen-Williams equation, Pressure, Water resources development, Economics, Mathematical models, Systems analysis.

Identifiers: Decomposition techniques.

Dynamic programming is used in analyzing a large number of system alternatives to design an optimal water distribution network. For this problem formulation, the annual capital costs for meeting discharges and pressures at various points are used. The cost is primarily that of the pipes. The length of a section of the network is given and may comprise pipes of different diameters and qualities; the quality is expressed using the Hazen-Williams formula. Using decomposition techniques, the cost expression can be broken down into a formula in which the transformations and constraints are explicitly defined for each stage. Stagewise optimization is readily achieved, and the problem is converted from a multiple decision single-stage problem into a multiple stage single-decision problem. A computer program is presented which selects the most economical pipe sizes for a water distribution network under given requirements or constraints regarding the discharges and pressures at various points in the network. (See also W73-13071) (Bell-Cornell)
W73-13072

AN INTERACTIVE DESIGN SYSTEM FOR WATER DISTRIBUTION NETWORKS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
T. J. Carlson, J. S. Hsu, and R. A. Deininger.
Research Report, UMICH-ENVSA-71-5, University of Michigan. School of Public Health, Ann Arbor, July 1971, 9 p, 3 fig, 3 ref, 2 append. OWRR-A-041-MICH (4).

Descriptors: *Water distribution (Applied), *Networks, *Design, *Computer programs, Evaluation, Economic feasibility, Optimization, Pipes, Costs, Hydraulics, Data collections, Operations research, Mathematical models.

A highly interactive system for the design of a water distribution network is described. The system of computer programs allows a designer to use a cathode-ray tube display terminal and evaluate in rapid succession alternate networks with the aim of finding an efficient one. Hopefully, by being able to evaluate many networks in a short time, the designer may come close to the optimal, least cost network. The specific terminal used in this study is a DEC 338 Cathode Ray Tube Graphics Terminal, which may be connected via telephone lines to the central computing facility at the University of Michigan which consists of an IBM 360 67 computer. Associated with the graphic terminal is a group of subroutines. The basic design system for evaluating and finding an effective water distribution network consists of a series of FORTRAN IV coded programs and subroutines which allow the designer a rapid evaluation of alternate networks. The problem is partitioned into two subproblems: (1) find a least cost network (this can be solved by linear or dynamic programming and is described in detail elsewhere); (2) find a good configuartion for the network. This is done heuristically on the CRT, and consists of a program which allows the display of a network and its interactive change. (Bell-Cornell)
W73-13073

THE EFFECT OF GROUND WATER LEVEL ON WATER MOVEMENT IN PEAT: A STUDY USING TRITIATED WATER,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
A. H. Knight, R. Boggie, and H. Shepherd.
J Appl Ecol, Vol 9, No 2, p 633-641, 1972. Illus.
Identifiers: Drainage, Ground water, *Peat, Topography, *Tritiated water, *Water levels.

Tritium was used to trace water movement through peat in 5 plots in which the water tables were maintained at different depths of 0-0.34 m below the surface. Tritiated water was applied to the surface of the peat and at intervals of time, up to 54 wk after application, peat below and adjacent to the treated areas was sampled and analyzed for radioactivity. Both downward and lateral movement was detected and these were related to the drainage treatments and topography.--Copyright 1973, Biological Abstracts, Inc.
W73-13093

ROOT DISTRIBUTION AND SOIL MOISTURE STUDIES IN SOME PERENNIAL RYEGRASS AND PHALARIS PASTURES ON SOUTHERN TABLELANDS, SOUTH-EASTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 02I.
W73-13110

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II.

Available from University of Arizona Tucson, Dept. of Hydrology and Water Resource, $22.00 a set. Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, Dec 11-14, 1972. p 450-933.

Descriptors: *Water resources development, *Planning, *Management, *Decision making, *Economics, *Systems engineering, *Stochastic processes, *Simulation analysis, *Hydrology, Data collections, Projects, Hydraulics, Time, Technology, Systems analysis, Mathematical models, Analytical techniques, Streamflow forecasting, Computer programs, Probability, Optimization, *Risks.
Identifiers: Data worth, Urban water management.

This is the second of three volumes on a symposium which focuses upon the role of the decision sciences in evaluating uncertainties inherent in water resource planning, design, investment, and operations. (See also W73-12269, and W73-13135 thru W73-13163) (Bell-Cornell)
W73-13134

PROBLEMS OF ANALYTICAL METHODS IN HYDROLOGIC DATA COLLECTIONS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-13135

CLIMATIC UNCERTAINTY EFFECTS ON MANAGEMENT AND DESIGN OF RESERVOIR-IRRIGATION SYSTEMS,
Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-13137

THE LINEAR DECISION RULE IN RESERVOIR MANAGEMENT AND DESIGN, 3, DIRECT CAPACITY DETERMINATION AND INTRASEASON CONSTRAINTS,
Johns Hopkins Univ., Baltimore, Md.
J. Eastman, and C. ReVelle.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 519-537, (1972) 1 tab, 7 ref, 1 append.

Descriptors: *Multiple-purpose reservoirs, *Design, *Management, *Constraints, *Linear programming, *Decision making, Seasonal, Storage, Water supply, Recreation, Flood control, Mathematical models, Systems analysis.
Identifiers: Capacity, Intraseason, Water releases.

A probabilistic model for multi-purpose reservoir operation is reviewed and extended. The model minimizes required capacity subject to chance constraints for water supply, recreation and flood control. A linear decision rule is used to make commitments based on existing storage. A study of the structure of this linear programming formulation reveals a direct solution in the special case when as much water as possible is reliably committed, a reasonable case for water supply. The structure of the model requires an adequate degree of continuity, generally restricting the model's usage to multi-purpose reservoirs. Using an execution rule to specify when within a decision period water will be released, the model is extended to include constraints on storage within a decision period. Increasing the length of a decision period produces a large increase in reservoir capacity due to making commitments for a longer future of uncertain inflows. Numerical examples are provided which demonstrate the increased capacity required in a seasonal model over that required in a monthly model and the effect of using intraseason constraints. (See also W73-13134) (Bell-Cornell)
W73-13138

'EXTENDED-RANGE' METEOROLOGICAL FORECASTS APPLIED TO MULTI-RESERVOIR MANAGEMENT DECISIONS,
Department of the Air Force, Scott AFB, Ill.
For primary bibliographic entry see Field 02A.
W73-13139

MODELLING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FUTURE WATER SUPPLIES,
Sun Oil Co., Dallas, Tex.
S. Y. Su, and R. A. Deininger.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 555-575, (1972) 8 fig, 2 tab, 13 ref.

Descriptors: *Lake Superior, *Regulation, *Water supply, *Future planning (Projected), *Markov processes, *Optimization, Stochastic processes, Reservoirs, Operation and maintenance, Water levels, Water loss, Economics, Mathematical models, Systems analysis, *Risks.

The problem of regulating Lake Superior via control at its outlet is considered. Monthly inflows to the reservoir are treated as stochastic random variables, and are assumed to be either statistically independent or correlated with the preceding month's inflow. The purpose was to find operating policies for the system which minimize the expected yearly losses in the undiscounted case, or the total expected losses over an infinite time horizon if the future losses are discounted. The system is modelled as a periodic Markovian decision problem. A general one-reservoir regulation system is described and an optimization model is developed. A new algorithm based on White's method of successive approximations for solving single-chained and completely ergodic Markovian decision problems has been developed and proven to be fairly efficient in terms of computer storage and computation. Transition probabilities of the net basin supplies are estimated from 64 years of data. Economic loss functions used in the model consist of losses due to navigation inconvenience and to shore property damage. An extensive sensitivity analysis was conducted to determine their influence on the optimal operating policies. Results show the definite possibility of reducing average yearly losses by at least 15% and monthly lake level variances by 25%. (See also W73-13134) (Bell-Cornell)
W73-13140

RESERVOIR MANAGEMENT: OPTIMAL PRICING AND RATIONING POLICIES UNDER UNCERTAINTY,
Montpellier Univ. (France). Faculte des Sciences.
A. Lobert, A. B. Whinston, and G. P. Wright.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 576-591, (1972). 2 fig, 20 equ, 11 ref.

Descriptors: *Reservoir operation, *Management, *Optimization, *Pricing, *Rationing (Water), *Water allocation (Policy), *Water supply, Water demand, Water delivery, Stochastic processes, Mathematical models, Systems analysis, *Risks.
Identifiers: *Water consumers, Social benefits.

This paper extends some previous work by Thomas, Whinston, and Wright, of allocating a stochastic amount of water where the parameter 'guaranteed probability of delivery' is a decision variable along with selling price in the demand functions. The water consumer sector is considered explicitly. Reviewed first are some of the results obtained from analysis of allocation models for selling water at different prices and different guaranteed delivery probabilities. Considered next is the water consumer sector, and the problem of estimating the demand functions and selling prices of different classes of water consumers differentiated by guaranteed delivery probability is discussed. Presented is an iterative and coordinative procedure for the estimation of demands, prices, and guaranteed delivery probabilities for water for a multi-period model where the supply of water, over time, is assumed to be a stochastic process. (See also W73-13134) (Bell-Cornell)
W73-13141

AN ANALYSIS OF SAMPLING-FREQUENCY ALTERNATIVES FOR FITTING A DAILY STREAM-TEMPERATURE MODEL,
Geological Survey, Washington, D.C.
E. J. Gilroy, and T. D. Steele.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 594-608, (1972). 13 tab, 6 ref.

Descriptors: Hydrology, *Streams, *Temperature, *Measurement, *Statistical models, *Sampling, *Frequency, Distribution, Analytical techniques, Systems analysis.
Identifiers: Daily, Harmonic parameters.

Daily stream-temperature measurements are fitted to a trigonometric regression model by using only observations obtained every I-th day in a given year for various values of I. The year-to-year variation of the parameters of the regression model has remained small over the values of I equal 1-, 7-, or 30-day increments. The largest increase in the coefficients of variation of the parameters was .04 for the amplitude of the harmonic in the case of I ± 30. A split-sample technique was used to estimate a frequency distribution of the absolute value of the residuals between observed stream temperatures and stream temperatures estimated from the harmonic function. The estimated stream temperatures are determined from a sine function fitted to only every J-th daily temperature measurement for J ± 1, 8, 15, 22, 29 in a given base year. A sample frequency distribution analysis of the residuals indicated that less-than-daily sampling frequencies give estimates of annual variation of stream temperatures that are comparable to estimates obtained from a daily sampling scheme. (See also W73-13134) (Bell-Cornell)
W73-13142

ESTIMATING BENEFITS TO IMPROVED SEASONAL WATER SUPPLY FORECASTS: A CASE STUDY OF IRRIGATION BENEFITS,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 03F.
W73-13143

BAYESIAN HYDROLOGIC MODEL BUILDING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13144

INFORMATION CONTENT OF THE REGIONAL MEAN,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13145

DEVELOPMENTS IN APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC MODELING,
IBM Space Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 02E.
W73-13146

DESIGN OF EXPERIMENTS FOR ESTIMATING PROCESS DYNAMICS,
Queen's Univ., Kingston (Ontario). Dept. of Mathematics.
D. G. Watts, and G. M. Minich.
In: Proceedings (Vol. II) International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 677-690, (1972). 23 ref.

Descriptors: *Dynamics, *Design criteria, Estimating, Control, Optimization, Model studies, Equations, Systems engineering, Planning.
Identifiers: Experiments, Autoregressive input.

The design of experiments involves first, careful description of the experimental system, second, characterization of the properties of the estimates which may be obtained, and third, choice of the design points or of a rule for determining the design points so as to optimize those properties according to the design criterion. The problem of identification of system dynamics is an important one to hydrologists. Much work has been done, from different starting points and with different perspectives and philosophies; a difficulty with this is the evolution of different nomenclature in each field, such as in the use of the term 'system identification.' The problem is discussed of designing an input to a dynamic system in order to best estimate the parameters in the model, according to some design criterion. General requirements of dynamic experimental designs are discussed. Two criteria are selected and applied to the simple case of discrete first-order dynamics. Design criteria used are precise estimation and precise control. Optimal input signals for these cases are derived and similarities and differences between the two criteria are explored. Extensions of the model are made to expose the sensitivity of the optimal inputs to changes in the assumed model, and to stress the necessity for multiple criteria of experimental design. (See also W73-13134) (Bell-Cornell)
W73-13147

STRATEGIC UNCERTAINTY AND THE NATIONAL ENVIRONMENTAL POLICY ACT,
Environmental Defense Fund, East Setauket, N.Y.
For primary bibliographic entry see Field 06B.
W73-13148

THE IMPACT OF WATER RESOURCES ON THE LOCATION OF ECONOMIC ACTIVITIES,
Technische Hochschule, Munich (West Germany).
For primary bibliographic entry see Field 06D.
W73-13149

SUBJECTIVE PLANNING: A MODEL FOR WATER RESOURCE DEVELOPMENT,
General Telephone Co. of the Southwest, San Angelo, Tex.
For primary bibliographic entry see Field 06A.
W73-13150

PROBLEMS OF WATER RESOURCE DEVELOPMENT IN THE GULF COAST ESTUARINE ZONE,
Forest Service (USDA), New Orleans, La. Southern Forest Experiment Station.
For primary bibliographic entry see Field 02L.
W73-13152

SOME POSSIBLE CHANGES IN FUTURE SOCIAL VALUES AND PRIORITIES: STRATEGIC IMPLICATIONS FOR WATER RESOURCES PLANNING,
Institute for Water Resources (Army), Alexandria, Va.
For primary bibliographic entry see Field 06B.
W73-13153

TREATMENT OF SOME OF THE UNCERTAINTIES ENCOUNTERED IN THE CONDUCT OF HYDROLOGIC COST-EFFECTIVENESS EVALUATIONS,
North American Rockwell Corp., Downey, Calif. Space Div.
For primary bibliographic entry see Field 06B.
W73-13154

A REPORT ON CORPS OF ENGINEERS RESEARCH ON THE MANAGEMENT OF UNCERTAINTY IN WATER RESOURCES PLANNING,
Decision Sciences Corp., Jenkintown, Pa.
For primary bibliographic entry see Field 06B.
W73-13155

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05D.
W73-13156

THE MARGIN OF SAFETY FOR COMPENSATING LOSSES DUE TO UNCERTAINTIES IN HYDROLOGICAL STATISTICS,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 06B.
W73-13157

UNCERTAINTY IN THE RETURN PERIOD OF MAXIMUM EVENTS: A BAYESIAN APPROACH,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02B.
W73-13158

HYDROLOGIC AND HYDRAULIC DESIGN UNDER UNCERTAINTIES,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-13159

DRY FARMING: UNCERTAINTY IN LAND AND WATER PRODUCTIVITY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 03F.
W73-13160

OPTIMAL DESIGN STRATEGY FOR SMALL FLOOD-CONTROL STRUCTURES,
Queen's Univ., Kingston (Ontario).
For primary bibliographic entry see Field 08B.
W73-13161

THE SENSITIVITY OF RETURN PERIODS TO VARIATIONS IN RETENTION LEVELS FOR DIFFERENT DEFINITIONS OF SHORTAGE,
Lancaster Univ., Bailrigg (England).
J. C. Wilkinson.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 917-925, (1972). 1 fig, 3 tab, 3 ref.

Descriptors: *Multiple-purpose reservoirs, *Reservoir storage, *Water shortage, *Reliability, *Water supply, *Flood control, Measurement, Water yield improvement, Seasonal, Runoff, Probability, Mathematical models, Systems analysis.
Identifiers: *Retention levels, *Llyn Celyn reservoir (North Wales), *River Dee (Wales).

In 1965, the Llyn Celyn regulating reservoir in North Wales was completed, primarily to augment the natural yield of the River Dee, but also for flood control. Monthly retention levels were established on an ad hoc basis and the system has operated effectively ever since. However, there exists no definition of what level of reservoir storage constitutes shortage, and consequently no measure of the reliability of the system. The River Dee Regulation Research Programme has derived optimal retention levels. Their derivation depends upon the repeated use of a recursive probabilistic model which uses estimates of the correlated probability distributions of runoff in the controllable and uncontrollable parts of the catchment for each month of the year. The use of the model to evaluate the present retention levels has suggested that perhaps more importance is attached, implicitly, to the secondary but more immediately perceived objective of mitigating floods than the primary aim of maintaining supply. Use of the model to explore, for different definitions of failure of the system, the dependence of return periods upon the monthly retention levels is described. Optimal retention levels for different desired return periods of shortage are compared with present operating levels. (See also W73-13134) (Bell-Cornell)
W73-13162

CONCERNING THE CALCULATION OF LEVEL VERIATION OF CUTOFF WATER BALANCE,
Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
I. V. Khomeriki.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 926-933, (1972). 1 tab, 8 ref.

Descriptors: *Water balance, *Monte Carlo method, *Stochastic processes, *Probability, *Hydrology, Influents, Withdrawal, Lakes, Basins, Mathematical models, Systems analysis.
Identifiers: *Closed water bodies, *Water level.

The calculation of expected levels of closed lakes is close to the general problems of water economy systems, although difficulties of such calculations have specific character connected primarily with withdrawal of water from influents and directly from water bodies for the development of irrigated farming and water consuming industry. Secondly, the difficulties of such calculations are associated with the stochastic character of hydrological and meteorological processes as the components of the water body balance to be taken into account. Presented are some considerations relating to the constructions of a calcuated model of the regime of a closed water body based on the Monte Carlo method. The following principle forms a basis for constructing the model: A single law of distribution is selected for probabilistic processes and the models of all components of the balance, based on the hypothesis of ergodicity, are to be gameplayed and the water balance calculations performed. (See also W73-13134) (Bell-Cornell)
W73-13163

MAGNITUDE AND FREQUENCY OF FLOODS IN SMALL DRAINAGE BASINS IN IDAHO--A DESIGN METHOD,
Geological Survey, Boise, Idaho.
C. A. Thomas, W. A. Harenberg, and J. M. Anderson.
Geological Survey open-file report, April 1973. 43 p, 11 fig, 4 tab, 15 ref, append.

Descriptors: *Flood forecasting, *Flood frequency, *Flow characteristics, *Streamflow, *Idaho, Methodology, Regression analysis, Mathematical studies, Equations, Peak discharge, Topography, Geology, Vegetation, Land use.

A method is described for estimating peak discharges at 10-, 25-, and 50-year recurrence intervals for most small streams in Idaho. Reliable estimates can be obtained using this method, but there are significant limitations and variations which should be considered. The method is for sites on streams with natural flow. Estimates of peak discharge may be poor for streams draining basins on, or flowing across, extensive areas of deep, coarse alluvium or lava flows; for streams whose basins are urbanized; for streams draining irrigated agricultural lands; and for streams draining basins having less than about 30% forest cover. Computed flows in those parts of the State subject to recurrent high intensity thunderstorms over small areas may be too low to be acceptable as reasonable estimates. Some anomalous areas have been identified where the method developed does not apply. (Woodard-USGS)
W73-13208

FUNCTIONAL AND PSYCHOLOGICAL INTEGRATION IN A RURAL COMMUNITY,
Pennsylvania State Univ., University Park. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 06B.
W73-13305

EFFECT OF PLANT MOISTURE STRESS ON CARBOHYDRATE AND NITROGEN CONTENT OF BIG SAGEBRUSH,
Utah Univ., Salt Lake City. Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-13309

THE PLANT ECOLOGY OF UTAH'S DESERT RANGELANDS,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 02I.
W73-13310

PRODUCTIVITY OF TALL WHEATGRASS AND GREAT BASIN WILDRYE UNDER IRRIGATION ON A GREASEWOOD-RABBITBRUSH RANGE SITE,
Agricultural Research Service, Reno, Nev. Plant Science Research Div.
For primary bibliographic entry see Field 03B.
W73-13314

RESPONSES OF SEMIDESERT GRASSES TO SEASONAL REST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
S. C. Martin.
Journal of Range Management, Vol 26, No 3, p 165-170, May 1973. 6 fig, 6 tab, 9 ref.

Descriptors: *Range management, *Forage grasses, *Seasonal, Environmental effects, *Plant growth, Range grasses, *Arizona, Ranges, Rainfall, Vegetation regrowth, Semiarid climates, Grazing, Spring, Summer, Winter, Weather, Forages, Droughts.
Identifiers: *Santa Rita Experimental Range (Ariz), Annuals, Perennials.

Ranging from continuous year-long grazing to year-long rest 2 years out of 3, 15 schedules of rest and grazing of perennial grasses on semidesert range in southern Arizona were evaluated from 1962 to 1969. Over this 8 year period spring-summer rest 2 years out of 3 produced the greatest improvement in the stands of perennial grasses. While herbage yields of annual grasses were negatively related to rainfall of the preceding June-January, yields of perennial grasses were more closely associated with the sum of current and past summer rainfall. This study indicates also that under any grazing system forage stands will improve during favorable growing seasons and decline during droughts and that the impact of weather on vegetation changes is often greater than the influence of management. Currently, a pilot test of a 3-pasture grazing system providing spring-summer rest 2 years in 3 is being conducted on the Santa Rita Experimental Range and is expected to demonstrate benefits to the range, the livestock, and the rancher. (Gloyd-Arizona)
W73-13318

METHODS FOR SEEDING THREE PERENNIAL WHEATGRASSES ON CHEATGRASS RANGES IN SOUTHERN IDAHO,
Agricultural Research Service, Reno, Nev. Plant Science Research Div.
G. J. Klomp, and A. C. Hull, Jr.
Journal of Range Management, Vol 25, No 4, p 266-268, July 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Wheatgrasses, *Seeds, *Planting management, *Idaho, Ranges, *Range grasses, Range management, Forage grasses, Deep tillage, Fallowing, Rainfall, Autumn, Herbicides, Plant growth, Crop production, Germination.
Identifiers: *Cheatgrass.

Throughout southern Idaho cheatgrass, an introduced winter annual, occupies vast areas, producing good forage and displaying an aggressive growth pattern. Nonetheless, it has many undesirable characteristics. Major one are early drying, high fire hazard, a short green-feed season, variable production is often replaced by weedy plants and is susceptible to replacement by medusahead. Efforts to improve the value of these rangelands by establishing more desirable perennial grass cover led to this study of planting techniques in dense stands of cheatgrass. Seeded grass stands were successful when cheatgrass was reduced to 12 plants per square foot during the initial growing season. Deep furrow drilling in the fall gave the best stands, followed by fall cultivation and drilling, and then by summer fallow and drilling. In low rainfall areas fall seeding is recommended, especially when cheatgrass has germinated early and rather completely. While not a recommended control, treatment with herbicides followed by drilling gave good seeded stands the first year. Seeding success was directly related to the kill of cheatgrass. (Gloyd-Arizona)
W73-13319

APPLICATION OF A SIMPLE HYDROLOGIC MODEL FOR RAINFALL-RUNOFF RELATIONS OF THE DALTON WATERSHED,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13362

TECHNIQUE FOR IMPLICIT DYNAMIC ROUTING IN RIVERS WITH TRIBUTARIES,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 02E.
W73-13363

USE OF CROSS CORRELATION BETWEEN HYDROLOGICAL TIME SERIES TO IMPROVE ESTIMATES OF LAG ONE AUTOREGRESSIVE PARAMETERS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 07C.
W73-13364

ONE-DIMENSIONAL CONSOLIDATION OF A CLAY LAYER WITH IMPEDED DRAINAGE BOUNDARIES,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W73-13368

EFFECT OF ACCRETION ON DYNAMICS OF GROUNDWATER BETWEEN TWO CHANNELS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
For primary bibliographic entry see Field 02F.
W73-13373

GROUNDWATER HYDROLOGY OF PRAIRIE POTHOLES IN NORTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-13383

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY: VOLUME I, MAIN REPORT.
For primary bibliographic entry see Field 06B.
W73-13480

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX I--FLOOD CONTROL.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 06B.
W73-13489

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX J--NAVIGATION.
Corps of Engineers, Chicago, Ill. North Central Div.
For primary bibliographic entry see Field 06B.
W73-13490

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX Q--FRAMEWORK FOR DEVELOPMENT.
For primary bibliographic entry see Field 06B.
W73-13497

PATHOGENICITY OF FUNGI AND BACTERIA FROM INDIA TO HYDRILLA AND WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 05C.
W73-13502

PATHOGENICITY OF RHIZOCTONIA SOLANI TO AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 05C.
W73-13503

GRASS AND GRASS UTILIZATION IN ICELAND,
Agricultural Research Inst., Reykjavik (Iceland).
S. Fridriksson.
Ecology. Vol 53, No 5, p 785-796, 1972. Illus.
Identifiers: Cattle, Control, *Erosion, Fodder, *Grass, Human population, *Iceland, Ponies, Sheep, Soils.

The total area of Iceland is approximately 103,500 km2 of which 40,000 km2 presumably was covered with vegetation at the time of settlement in 874 A.D. During the 1100 yr of occupancy, serious erosion has taken place, resulting in the deterioration of the grassland. At present, the total area of vegetation is only 20,000 km2 giving an average annual erosion rate of 20 km2. As the human population, which reached 80,000 individuals during the Age of Settlement, relied to a great extent on animal products it was indirectly dependent on the output of the natural grassland that dwindled with time and thus the human population decreased up to the last century. With modern cultivation techniques, erosion is gradually being checked and it has been possible to provide fodder for the nation's increased livestock. Today the natural grassland, which to some extent is overstocked, provides summer pasture for 800,000 sheep and 30,000 ponies while the lowland pastures around the homesteads supply grazing for 60,000 dairy cattle. Sheep and cattle are housed and fed indoors on hay and artificial feeds during the winter months. Half the fodder is now obtained from cultivated land. Thus the Icelandic agriculture is, at present, capable of supporting a nation of 200,000 individuals.--Copyright 1973, Biological Abstracts, Inc.
W73-13510

A SURVEY OF THE WATER RESOURCES OF ST. THOMAS, VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 02A.
W73-13516

ECONOMIC CRITERIA FOR DECISIONS ON PRESERVATION AND USE OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 06B.
W73-13518

FLOOD OF MARCH 19-20, 1970, METROPOLITAN BIRMINGHAM AND JEFFERSON COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-13521

A MATHEMATICAL MODEL FOR PRELIMINARY EVALUATIONS OF CANDIDATE RESERVOIR SYSTEMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08D.
W73-13529

PROPOSED CENTRAL ARIZONA PROJECT (FINAL ENVIRONMENTAL STATEMENT). AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS EIS-AZ-72-5-357-F1. BUREAU OF RECLAMATION, BOULDER CITY, NEVADA. (FES 72-35) SEPTEM BER 1972, 597 P. MAPS. 203 REF.
Bureau of Reclamation, Boulder City, Nev. Region 3.

Descriptors: *Environmental effects, *Water conveyance, *Aqueducts, *Multiple purpose, Water utilization, *Arizona, Water resources development, Water resources, Reservoirs, Alternate planning, Cost-benefit analysis, Aesthetics, Deserts, Environment, Maps, Canals.
Identifiers: Central Arizona Project, *Lake Havasu (Ariz).

A long-term average of 1.2 million acre-feet of water will be pumped annually from Lake Havasu for multipurpose uses. This new supply of water will be managed with local supplies to provide flexibility in meeting the demand for water imposed by municipal, industrial, and agricultural uses. Project water will be used as a replacement for ground water. The aqueduct system will be about 371 miles long and require about 16,000 acres of right-of-way supporting mostly desert shrub vegetation. The four reservoirs will require about 38,000 acres typically supporting deciduous treex near the channel and mesquite, grasses, forbs, cacti, and associated desert shrubs on the adjacent terraces. The existing biota and esthetic values will be influenced by the construction of reservoirs and the physical modification of topography and vegetation resulting from construction of project features. Some Indian lands and primitive and wilderness areas will be affected. Sections included in the statement are: description of the proposal, description of the environment, environmental impact of the C.A.P., environmental considerations including mitigation and enhancement features included in the proposed action, adverse impacts which cannot be avoided, the relationship between short-term use of the environment and the maintenance and enhancement of long-term productivity, irreversible and irretrievable commitments of resources involved in the C.A.P., alternatives to the project, and consultation and coordination. (Paylore-Arizona)
W73-13552

EFFECT OF CLEAR CUTTING IN THE WATER REGIME OF THE PRINCIPAL FOREST TREES OF THE SEVAN SHORE, (IN RUSSIAN),
P. A. Khurshudyan, N. A. Papikyan, and M. G. Gezalyan.
Biol Zn Arm. Vol 24, No 10, p 34-37. 1971.
Identifiers: *Cutting (Forests), Growth, Moisture, Poplar, Regulation, *Sevan shore, Soils, Transpiration, Trees, USSR.

Clear cutting, increasing the soil moisture in the rhizosphere, increased the rate of transpiration and growth of poplars. Clear cutting may be used to regulate to some extent the water regime of plantings, especially young ones, thus creating favorable conditions for forest growth on these areas.--Copyright 1973, Biological Abstracts, Inc.
W73-13593

4B. Groundwater Management

MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU THERMAL PROBE,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02F.
W73-13013

SIMULATION OF COUPLED LEAKY AQUIFERS AND SURFACE-WATER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02A.
W73-13014

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN NORTHERN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 06D.
W73-13042

WATER LEVELS AND SPRING DISCHARGES FOR SELECTED WELLS AND SPRINGS IN NEVADA, 1966-69,
Geological Survey, Lakewood, Colo.
D. D. Gonzalez, C. T. Warren, and C. L. Washington.
Available from NTIS, Springfield, Va. 22151 as USGS-474-171 Price $5.45 printed copy; $1.45 microfiche. Report USGS-474-171 (NTS-248), July 1973. 69 p, 2 fig. AEC AT (29-2)-474.

Descriptors: *Groundwater resources, *Water levels, *Water wells, *Aquifers, *Nevada, Water yield, Water level fluctuations, Basic data collections, Springs, Well data.

Surface-water and groundwater data were collected from selected wells and springs in Nevada. Data were collected for the period 1966-69 from groundwater wells, gaging stations, miscellaneous sites, and four hot spring sites. A brief description of measurement sites is given. One phase was a data collection network to evaluate possible effects of nuclear explosions on the hydrology of springs and wells. Locations of gaging stations, wells, and miscellaneous spring sites are shown. (Woodard-USGS)
W73-13043

ANALYSIS OF SOME INORGANIC CONSTITUENTS IN WELL WATERS AND THEIR SEDIMENTS,
Dental Coll. Hospital, Lucknow (India). Fluoride Study Unit.
R. S. Nanda, and K. Kapoor.
Indian J Med Res. Vol 60, No 6, p 949-952. 1972.
Identifiers: Inorganic constituents, Sediments, *Well water, Sampling, *Water analysis.

Well water samples (100) were analyzed for their contents of fluoride, phosphate, Mg, Ca, chloride and hardness for each of the 3 seasons to discover if there were differences in the concentration of these constituents in the sedimented and respective clear samples. A study of seasonal variation in sediments and clear samples was included. All these constituents were significantly greater in the sediments than in the clear samples in the summer. Fluoride, phosphate and Mg in the winter sediment samples were significantly higher. Analysis of variance applied to the data revealed significant seasonal differences for each constituent.--Copyright 1973, Biological Abstracts, Inc.
W73-13151

WATER RESOURCES OF BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02A.
W73-13209

DETECTION OF FRESH WATER AQUIFERS IN THE GLACIAL DEPOSITS OF NORTHWESTERN MISSOURI BY GEOELECTRICAL METHODS,
Missouri Univ., Rolla. Geophysical Observatory.
R. K. Frohlich.
Water Resources Bulletin, Vol 9, No 4, p 723-734, August 1973. 6 fig, 2 tab, 13 ref. OWRR A-046-MO (2).

Descriptors: *Geophysics, *Electrical studies, *Exploration, *Hydrogeology, Aquifer characteristics, Groundwater, Water quality, Surveys, Glacial drift, *Missouri, Conductivity, Resistivity.

Geoelectrical investigations were used to find aquifers in glacial deposits in Grundy County of northwestern Missouri. The groundwater resources of the glacial deposits have already been examined through an extensive drilling program. Water-bearing gravel deposits can be distinguished from glacial deposits containing appreciable amounts of clay and limited amounts of water. The Schlumberger method used for the geoelectric depth soundings in the vicinity of the drillholes demonstrates the exploratory usefulness of the method in that it can partly replace drilling. The method also provides improved interpretation between drillholes. Clay has a resistivity below 20 ohm-m, the freshwater-bearing gravel at the bottom of the buried glacial stream channels has a resistivity of 40 to 50 ohm-m, and the near surface glacial gravel deposits have a resistivity above 100 ohm-m. Interpretation of the depth soundings and the conductivity of water obtained from a local well implies that its water is drawn from the saline water of the bedrock. (Knapp-USGS)
W73-13213

GEOTHERMAL ENERGY--RESOURCES, PRODUCTION, STIMULATION.
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W73-13214

EXPLORATIONS FOR GEOTHERMAL RESOURCES,
California Univ., Riverside. Dept. of Geological Sciences; and California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 03E.
W73-13219

STIMULATION OF GEOTHERMAL SYSTEMS,
Division of Applied Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 08C.
W73-13225

CHEMICAL EXPLOSIVE STIMULATION OF GEOTHERMAL WELLS,
Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 08H.
W73-13229

ENVIRONMENTAL ASPECTS OF NUCLEAR STIMULATION,
Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08H.
W73-13230

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED POROUS MEDIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 05B.
W73-13302

CLOGGING IN SIMULATED GLACIAL AQUIFERS DUE TO ARTIFICIAL RECHARGE,
Illinois Univ., Chicago. Dept. of Geological Sciences.
D. P. Ripley, and Z. A. Saleem.
Water Resources Research, Vol 9, No 4, p 1047-1057, August 1973. 6 fig, 2 tab, 21 ref.

Descriptors: *Artificial recharge, *Injection wells, *Water quality, *Clogging, Glacial drift, Aquifers, Well filters, Recharge, Bacteria, Turbidity.
Identifiers: Aquifer clogging.

Clogging due to artificial recharge was tested in laboratory simulated unconsolidated aquifers. Recharge with turbid water containing an effective microbial inhibitor showed clogging throughout the aquifers ranging in length from 48 to 123 cm. The rate of clogging at different depths was dependent on the size distribution of the particles in the water relative to the pore size distribution of the porous media. Clogging tended to be more severe at the influent portion of the sample; however, when the particles in the recharge water were smaller in size or when the pore sizes of the porous media were larger, the result was a more uniform rate of clogging with respect to depth. Recharge with nonturbid water and no effective microbial inhibitor shows clogging only in the top few centimeters. If it is not understood that these two patterns result from different causes, such a pattern resulting from the combined factors could be attributed to only one cause, turbidity. (Knapp-USGS)
W73-13374

GROUNDWATER: FROM WINDMILLS TO COMPREHENSIVE PUBLIC MANAGEMENT,
Nebraska Univ., Lincoln. School of Law.
For primary bibliographic entry see Field 06E.
W73-13505

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1972.
Geological Survey, Austin, Tex.

Edwards Underground Water District Bulletin 31, July 1973. C. Puente, Compiler. 8 p, 1 tab, 12 ref.

Descriptors: *Groundwater, *Texas, *Water yield, *Discharge (Water), Aquifers, Wells, Springs, Data collections.
Identifiers: Edwards Limestone (Tex), *San Antonio (Tex).

The estimated total well and spring discharge from the Edwards and associated limestones in the San Antonio area of Texas during 1972 was 747,100 acre-feet, which is the record high for the period 1934-72. The increase was due primarily to above-average springflow. The total discharge from wells and springs for 1972 was about 10% more than in 1971, and 38% greater than the average for 1934-71. About 50% of the total discharge came from wells, and approximately two-thirds of this discharge was from wells in Bexar County. Well discharge in 1972 was 10% less than in 1971, while springflow increased by about 37%. (Knapp-USGS)
W73-13515

A SURVEY OF THE WATER RESOURCES OF ST. THOMAS, VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 02A.
W73-13516

MAP SHOWING RANGES IN PROBABLE MAXIMUM WELL YIELD FROM WATER-BEARING ROCKS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W73-13519

MAPS SHOWING AREAS IN THE SAN FRANCISCO BAY REGION WHERE NITRATE, BORON, AND DISSOLVED SOLIDS IN GROUND WATER MAY INFLUENCE LOCAL OR REGIONAL DEVELOPMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-13520

WATER RESOURCES AND GEOLOGY OF MOUNT RUSHMORE NATIONAL MEMORIAL, SOUTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-13522

SUBSIDENCE OF THE VENICE AREA DURING THE PAST 40,000 YR,
Laboratoire de Geologie Dynamique, Paris (France).
For primary bibliographic entry see Field 02F.
W73-13526

USE OF A NEUTRON MOISTURE PROBE TO DETERMINE THE STORAGE COEFFICIENT OF AN UNCONFINED AQUIFER,
Geological Survey, Garden City, Kans.
W. R. Meyer.
Geological Survey Professional Paper 450-E, p E174-176, 1962. 1 fig, 2 tab, 2 ref.

Descriptors: *Pump testing, *Storage coefficient, Unconsolidated aquifers, Theis equation, *Field capacity, Well data, *Kansas, Dewatering, Observation wells.
Identifiers: *Neutron moisture probe, Unconfined aquifers, Alluvial aquifers.

Under field conditions, the storage coefficient of an unconfined aquifer was determined by using the Thiem equation and a modified form of the Theis nonequilibrium formula to analyze the drawdown data from a pumped well. These results were compared with those obtained by using a neutron moisture probe placed at various depths in the aquifer. Values for the storage coefficient as determined by the Thiem and Theis equations were 0.19 and 0.21 respectively; as determined by the moisture probe (measuring moisture content before and after drainage) the storage coefficient was 0.215. (Campbell-NWWA)
W73-13554

A PERISCOPE FOR THE STUDY OF BOREHOLE WALLS, AND ITS USE IN GROUND-WATER STUDIES IN NIAGARA COUNTY, NEW YORK,
Geological Survey, Washington, D.C.
F. W. Trainer, and J. E. Eddy.
Geological Survey Professional Paper 501-D, p D203-206, 1964. 2 fig, 3 ref.

Descriptors: *Logging (Recording), Water wells, Dolomite, Carbonate rocks, *Boreholes, Fractures (Geologic), Gypsum, *Groundwater availability, *New York.
Identifiers: *Periscopes, *Borehole studies, Solution cavities, Temperature logs, *Permeable zones, Niagara County (NY).

A periscope made of aluminum tubing with a mirror and light at one end and a telescope at the other was used to study fractures in dolomite in shallow drill holes in western New York. Correlation of fractures observed with the periscope with inflections in temperature profiles in a well where downward flow occurs during periods of no pumping confirmed that the inflections coincide with waterbearing fractures in the rock. The periscope has also been used for examining well casings, well screens, and pump columns, and, in some places, for determining the texture and composition of the wallrock. (Campbell-NWWA)
W73-13555

ESTIMATING WATER QUALITY FROM ELECTRICAL LOGS,
Geological Survey, Baton Rouge, La.
A. N. Turcan, Jr.
Geological Survey Professional Paper 450-C, p C135-136, 1962. 2 fig, 1 tab, 6 ref.

Descriptors: Logging (Recording), *Electrical well logging, *Resistivity, Salinity, Chlorides, Water quality, *Louisiana, Standards.
Identifiers: Chloride ion concentration, *Conductance, Empirical methods, Wilcox group.

A Louisiana study has shown that it is generally possible to calibrate the readings of the electric log in terms of water salinity for a given area. By finding the resistivity of the formation tapped and applying a factor known as the field formation resistivity factor, which is the ratio of formation resistivity to formation water resistivity, the formation water resistivity could be calculated. Too low a value for formation water resistivity indicates salinity greater than accepted standards for fresh water. All values must be determined for each particular area. (Campbell-NWWA)
W73-13556

A PORTABLE SAMPLER FOR COLLECTING WATER SAMPLES FROM SPECIFIC ZONES IN UNCASED OR SCREENED WELLS,
Geological Survey, Ocala, Fla.
R.N. Cherry.
Geological Survey Professional Paper 525-C, p C214-216, 1965. 1 fig, 1 tab.

Descriptors: Water wells, *Sampling, Logging (Recording), Pumps, *Water quality, Dissolved solids, *Water analysis, Groundwater, Florida.
Identifiers: *Submersible pumps, *Water-bearing zones, Fracture zones, Inflatable packers.

A water sampler for use in uncased or screened wells which tap more than one water-bearing zone is described. It consists of two inflatable packers, and of a submersible pump which removes water from the section of the well isolated by the packers. Auxiliary instruments can be used to measure temperature, specific conductance, or other characteristics of the water in the isolated interval during pumping. The sampler is easily handled and is readily moved from one position to another and reset without removing it from the well. (Campbell-NWWA)
W73-13557

GROUND-WATER CONTAMINATION AND LEGAL CONTROLS IN MICHIGAN,
For primary bibliographic entry see Field 05B.
W73-13562

PRELIMINARY REPORT ON THE DISPOSAL OF OIL-FIELD BRINES IN THE RITZ-CANTON OIL FIELD, MCPHERSON COUNTY, KANSAS,
Bureau of Mines, Bartlesville, Okla. Petroleum Experiment Station.
For primary bibliographic entry see Field 05G.
W73-13564

UNDERGROUND SURVEYS WITH BOREHOLD CAMERAS,
Pennsylvania Drilling Co., Pittsburgh.
F. C. Sturges.
In: Proceedings, 12th Symposium on Exploration Drilling, University of Minnesota, School of Mining and Metallurgical Engineering, Minneapolis, Minnesota, p 39-52, 1967.

Descriptors: Logging (Recording), *Borehole cameras, Core drilling, *Geologic investigations.
Identifiers: *Television cameras, Film-type cameras, Rescue operations, Mine surveys, Mine subsidence, *Stroboscopic light, *Underground surveys.

One of the developing phases of exploration - the use of borehole cameras to supplement information obtained by drilling is discussed. Ways in which these borehole cameras can supplement diamond cores where rock conditions are conducive to core losses are investigated. Types of borehole cameras, results obtained with them, and how borehole camera data have been used to solve problems on mining and civil engineering projects are shown. (Campbell-NWWA)
W73-13566

DESIGN OF CASINGS AND SCREENS FOR WATER PRODUCTION AND INJECTION WELLS,
Moss (Roscoe) Co., Los Angeles, Calif
For primary bibliographic entry see Field 08B
W73-13568

GROUND WATER DEVELOPMENT AND MANAGEMENT IN THE OWENS VALLEY,
Department of Water and Power, Los Angeles, Calif.
D. E. Williams.
Paper presented at Annual AWWA Conference, San Francisco, California, 12 p, 1970. 5 fig, 3 ref.

Descriptors: *Groundwater, Groundwater barriers, *California, *Groundwater recharge, *Alluvial aquifers, Basalts, Faults (Geologic), Explosives, Drilling, Water wells.
Identifiers: *Volcanic aquifers, Lava flows, Faultblocks, Incrustation, *Well cleaning, Shaped-charge explosives, Blasting, *Owens Valley (Calif).

New techniques of development and management of groundwater reservoirs are currently being practiced by the City of Los Angeles in the operation of their Owens Valley ground water reservoir. These techniques include: utilization of earthquake faults as ground water dams, downhole photographic devices, well drilling using directional explosives, well cleaning using a high energy electric arc and various mathematical and viscous-flow modeling techniques. (Campbell-NWWA)
W73-13569

4C. Effects on Water of Man's Non-Water Activities

ATTITUDES OF RIPARIANS TOWARDS THEIR LAKE ENVIRONMENTS: A STUDY OF LAKE WYOLA AND DAMON POND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 06A.
W73-13007

THE EFFECT OF URBANIZATION ON RUNOFF QUANTITY,
Delaware Univ., Newark. Dept. of Civil Engineering.
G. L. Grunkemeyer.
M Sc Thesis, May 1972. 84 p, 31 fig, 12 tab, 20 ref. OWRR-A-017-DEL (1).

Descriptors: *Urban hydrology, *Urbanization, *Delaware, *Rainfall-runoff relationships, Water balance, Infiltration, Suburban areas.
Identifiers: *Red Clay Creek (Del), *Wilmington (Del).

Red Clay Creek drainage basin, Delaware, is being developed into a populated and urbanized area. Runoff from Red Clay Creek basin showed a decreasing trend during the 1944 through 1969 period of study. This decrease was cuased by an even greater decreasing trend in precipitation. The fact that runoff dropped by a lesser amount than did precipitation reflects an increasing trend in runoff. Basic land use in Red Clay Creek basin is agricultural. Ground slopes range from nearly flat to as high as 15% to 18%. Woodlands still cover over one quarter of the basin's land area. Slightly less than one quarter of the basin is used for pastures. Urbanization is only in the first stages. Urban development probably will increase during the next decade because of the basin's proximity to Wilmington. (Knapp-USGS)
W73-13032

ECOLOGICAL EFFECTS OF SNOWMOBILES,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
P. W. Neumann, and H. G. Merriam.
Can Field Nat. Vol 86, No 3, p 207-212. 1972.
Identifiers: *Canada (Ottawa), Ecological effects, Fox, Hare, Pine, *Snowmobiles.

Ecological impact of snowmobiles was studied in the Ottawa area, Canada. Snow structural changes by snowmobiles had significant effects on temperature gradients, water holding capacity and melting rate. Snowshoe hare and red fox mobility and distribution also were affected. Snowmobile damage to hardwood saplings and planted pines was significant. Browsing was unaffected except on damaged saplings.--Copyright 1973, Biological Abstracts, Inc.
W73-13113

WATER POLLUTION AND ASSOCIATED EFFECTS FROM STREET SALTING,
Edison Water Quality Research Lab., N. J.
For primary bibliographic entry see Field 05B.
W73-13471

EFFECTS OF HIGHWAY DE-ICING SALTS ON GROUNDWATER AND WATER SUPPLIES IN MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 05B.
W73-13525

4D. Watershed Protection

ENGINEERING HYDROLOGY,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 03B.
W73-13016

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

STUDIES ON THE INTERACTIONS OF BACTERIA AND NEMATODES,
Auburn Univ., Ala. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 05C.
W73-13001

DATA ACQUISITION SYSTEMS IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-13024

CONTRIBUTIONS OF ALLOCHTHONOUS DETRITUS TO THE ENERGY REGIME OF DOE RUN, MEADE COUNTY, KENTUCKY,
Louisville Univ., Ky. Water Resources Lab.
For primary bibliographic entry see Field 05B.
W73-13056

DETERMINATION OF LOW PHOSPHATE CONCENTRATIONS IN SEAWATER BY AN ISOBUTYL ACETATE EXTRACTION PROCEDURE,
Osservatorio Geofisico Sperimentale, Trieste (Italy).
B. S. Cescon, and P. G. Scarazzato.
Limnology and Oceanography, Vol 18, No 3, p 499-500, May 1973. 1 tab, 3 ref.

Descriptors: *Phosphates, *Sea water, *Water analysis, *Solvent extractions, Chemical analysis, Solvents.
Identifiers: Isobutyl acetate.

Isobutyl acetate is proposed as an extracting reagent for the determination of low phosphate concentrations in seawater. Because this ester is immiscible with water, its use improves both the accuracy and the ease of the method. (Knapp-USGS)
W73-13057

THE POLAROGRAPHIC DETERMINATION OF TRACE AMOUNTS OF CYANIDE,
Salford Univ. (England). Dept. of Chemistry and Applied Chemistry.
L. S. Bark, and B. S. Lim.
Water Research, Vol 7, No 8, p 1209-1213, August 1973. 2 fig, 13 ref.

Descriptors: *Water analysis, *Poisons, *Polarographic analysis, Copper, Chemical analysis, Industrial wastes, Pollutant identification.
Identifiers: *Cyanide.

A method is proposed for the indirect determination of trace amounts of cyanide. After release and distillation of the cyanide, which is collected in 1.0 M sodium hydroxide, the cyanide is reacted with a known and excess amount of copper (II) ions. The excess of the Cu (II) ions is determined by polarography, and from the amount of Cu (II) which has reacted, the amount of cyanide originally present is calculated. (Knapp-USGS)
W73-13067

ENZYMATIC NH3-N DETERMINATION: A SPECIFIC METHOD FOR THE DETERMINATION OF AMMONIA IN WATER AND SEDIMENTS,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
H. Verdouw.
Water Research, Vol 7, No 8, p 1129-1136, August 1973. 4 fig, 3 tab, 9 ref.

Descriptors: *Ammonia, *Nitrogen, *Chemical analysis, *Enzymes, *Water analysis, Sediments, Water quality, Organic compounds.

An enzymatic method for the determination of ammonia-nitrogen, not previously applied in water research, is described. The method is specific for NH3-N, and the risk of hydrolysis of organic nitrogen compounds is very small, because of near neutral pH and low (room) temperature conditions. Differences between results of enzymatic NH3-N determination and of a distillation method depend on the type of water. The method was adapted for application in sediment research, where the exchangeable NH3-N fraction is determined directly, without an extraction procedure. In comparison with this method, direct distillation of sediment samples gave an overestimation of the NH3-N content of 40%. (Knapp-USGS)
W73-13068

SLIME PRODUCTION BY PSEUDOMONAS AERUGINOSA. II. A NEW SYNTHETIC MEDIUM AND CULTURAL CONDITIONS SUITABLE FOR SLIME PRODUCTION BY PSEUDOMONAS AERGINOSA,
Toho Univ., Tokyo (Japan). School of Medicine.
For primary bibliographic entry see Field 05C.
W73-13088

DETECTING AND MEASURING OIL ON WATER,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas.
Instrum Technol., Vol 19, No 9, p 54-59, 1972. Illus.
Identifiers: *Oil pollution, Water pollution sources, *Pollutant identification, Measurement.

Any difference in the properties of oil and water offers a potential method for detection pollution. Successful detectors can discriminate among different oil types and are not confused by other pollutants which may resemble oil. A group of detectors which have had some success is examined from the viewpoints of the effects exploited and how much information can be delivered.--Copyright 1973, Biological Abstracts, Inc.
W73-13094

YELLOWSTONE NATIONAL PARK, BASELINE WATER QUALITY SURVEY REPORT.
Environmental Protection Agency, Kansas City, Mo. Region VII; and Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 05B.
W73-13133

A METHOD FOR THE DETECTION OF TRACES OF NITROSAMINES USING COMBINED GAS CHROMATOGRAPHY AND MASS SPECTROMETRY,
Laboratory of the Government Chemist, London (England).
T. A. Gough, and K. S. Webb.
Journal of Chromatography, Vol 79, p 57-63, May 16, 1973. 6 fig, 3 tab, 13 ref.

Descriptors: Water analysis, *Food, *Gas chromatography, *Mass spectrometry, Separation techniques, Time, Laboratory equipment, *Pollutant identification.
Identifiers: *GC-Mass spectrometry, *Nitrosamines, Pyrrolidylnitrosamine, Piperidylnitrosamine, Dibutylnitrosamine, Dipropylnitrosamine, Dietaylnitrosamine, Dimethylnitrosamine, Pressure programming, Carcinogens, Chromatograms.

A gas chromatography and high-resolution mass spectrometer, coupled via a membrane separator, were used for the analysis of samples of water and foods for traces of nitrosamines. The nitrosamines studied were dimethyl, diethyl, diprophyl, dibutyl, piperidyl, and pyrrolidyl. The nitrosamines were detected by parent ion monitoring with a detection limit of 1 mg/l on injected material. The gas chromatography incorporates a pressure-programming and peak-cutting device which is described in detail. Overall analysis time is substantially shorter than for isothermal or temperature-programmed runs. (Little-Battelle)
W73-13165

CHROMATOGRAPHIC SEPARATION OF PHENOLS USING AN ACRYLIC RESIN,
Ames Lab., Iowa.
J. S. Fritz, and R. B. Willis.
Journal of Chromatography, Vol 79, p 107-119, May 16, 1973. 15 fig, 3 tab, 18 ref.

Descriptors: *Separation techniques, *Phenols, *Resins, *Aqueous solutions, Water analysis, Solvents, Calibrations, Instrumentation, Laboratory equipment.
Identifiers: *Amberlyst XAD-7, *Liqud chromatography, Chlorophenol, Methylphenol, Bromophenol, Cresols, o-Bromophenol, p-Bromophenol, M-Bromophenol, 2 4-Dibromophenol, Pentabromophenol, o-Chlorophenol, p-Chlorophenol, m-Chlorophenol, 2 4 -Dichlorophenol, 3 5-Dichlorophenol, 2 3 6-Trichlorophenol, 2 3 4 5-Tetrachlorophenol, p-Cresol, Pentachlorophenol, m-Cresol, o-Cresol, 3 5-Dimethylphenol, 2 6-Dimethylphenol, 3 4 5-Trimethylphenol, 2 4 6-Trimethylphenol, Organic solvents, Chromatograms, Distribution coefficients.

A liquid chromatograph is described that uses gas pressure on water to force eluents through the column. A macroporous polyacrylate resin, Amberlyst XAD-7, was used in conjunction with

methanol-water or basic aqueous eluents for separation of mixture of phenols. The elution characteristics of twenty-one phenols are described. These included bromophenols, chlorophenols, cresols, and methylphenols. Several separations of actual mixtures are shown to demonstrate the separation capabilities of this system. (Little-Battelle)
W73-13166

POLARIZATION: A KEY TO AN AIRBORNE OPTICAL SYSTEM FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
J. P. Millard, and J. C. Arvesen.
Science, Vol 180, No 4091, p 1170-1171, June 15, 1973. 2 fig, 4 ref. *Oil spills, *Aerial photography, *Remote sensing, Water pollution, *Pollutant identification, Oil pollution, Reflectance, Opical properties, On-site data collections, Cameras, Thin films, Photogrammetry.

Decriptors: *Oil spills, *Aerial photography, *Remote sensing, Water pollution, *Pollution identification, Oil pollution, Reflectance, Optical properties, On-situ data collections, Cameras, Thin films, Photogrammetry.
Identifiers: *Aerial surveillance, *Skylight polarization, *Optical systems, Polarization, Azimuths.

The detection of oil slicks can be improved by utilizing polarization techniques. Good contrast was obtained in a study of oil slicks by viewing a specific polarization component. Skylight polarization, which varies with the position of the sun in the sky, influences the contrast of oil on water. Good contrast is most consistently obtained by viewing in azimuth directions toward or away from the sun. Contrast is enhanced by imaging selected polarization componenets and by taking the difference between orhtogonal polarization components. (Holoman-Battelle)
W73-13167

SEPARATION OF NTA AND EDTA CHELATES BY THIN-LAYER CHROMATOGRAPHY,
Environmental Health Directorate, Ottawa (Ontario).
F. J. M. Rajabalee, M. Potvin, and S. Laham.
Journal of Chromatography, Vol 79, p 375-379, May 16, 1973. 5 tab, 10 ref.

Descriptors: *Separation techniques, *Pollutant identification, Aqueous solutions, Color reactions, Alkali metals, Heavy metals, Methodology, Nitrilotriacetic acid, Chemical analysis, Solvents, Sodium, Cadmium, Copper, Nickel, Zinc, Cobalt, Lead, Cations.
Identifiers: *Thin layer chromatography, *Metal-EDTA chelates, *Metal-NTA chelates, Mixtures, Chromagenic reagents, Metal chelates.

The chromatographic behavior of metal-NTA chelates on silica gel is described as well as their separation from the corresponding EDTA chelates. The metal-EDTA and metal-NTA chelates, and metal ions were applied to silica gel thin-layer plates in aqueous solutions. The amount spotted was 0.5 microgram for the metal ions and NTA chelates, and 2 micrograms for the EDTA chelates. The spots were revealed by the praying technique and the colors observed in daylight. At high pH (solvents containing more than 1 percent of ammonia) chelate decomposition occurs and, in several cases, double fronts are observed. Only the nickel-NTA chelates were stable under these conditions. In weekly basic and neutral solvents, separation occurred and reliable R sub F values were obtained. These were identical for the different NTA chelates of the same metal, irrespective of the number of NTA moieties in the molecule. The TLC method is rather effective for separating mixtures of EDTA and NTA chelates. The metal cations can also be distinguished by the characteristic colors observed with the different spray reagents used. For a given divalent metal, the NTA chelate migrates faster in the same solvent than its EDTA analog, being less polar than the latter. (Holoman-Battelle)
W73-13168

A NEW CHROMOGENIC REAGENT FOR THE DETECTION OF PHENOLIC COMPOUNDS ON THIN-LAYER PLATES,
Punjab Agricultural Univ., Ludhiana, (India). Dept. of Chemistry and Biochemistry.
I. S. Bhatia, J. Singh, and K. L. Bajaj.
Journal of Chromatography, Vol 79, p 350-352, May 16, 1973. 1 tab, 6 ref.

Descriptors: *Phenols, *Pollutant identification, *Color reactions, *Methodology, Chemical analysis, Organic acids, Chemical reactions
Identifiers: *Thin-layer plates, *Chromogenic reagents, Silica Gel G, Polyamide, Aldehydes, Bourbonal, Dihydroquercetin, Vanillic acid, Veratric acid, Syringaldehyde, Vanillin, Vanillal, Syringic acid, Ferulic acid, Isoferulic acid, Guaiacol, Hesperidin, Sinapic acid, Naringin, Thymol, Salicylic acid, Tyrosine, Picric acid, Gentisic acid, Homogentisic acid, Phloroglucinal, Rutin, Caffeic acid, Ellagic acid, Pyrocatechol, Taxifolin, Protocatechuic acid, Chlorogenic acid, Adrenaline, Quercetin, Tannic acid, Pyrogallol, Gallic acid, Methyl gallate.

A sensitive chromogenic reagent has been described that not only detects most of the naturally occurring phenolic compounds, but can also be used to detect specifically the ortho-dihydroxy group on both Silica Gel G and polyamide thin layers. Four micrograms of phenolic compounds dissolved in acetone were spotted onto thin-layer plates. The plates were sprayed with chromogenic reagent I which consists of sodium tungstate, TCA, HCl, and sodium nitrite solution. After 3 min, Chromogenic reagent II (NaOH solution) was sprayed on the plates. With polyamide, after using reagent I, the thin layers are dried at 30 degrees for a few minutes and then lightly sprayed with reagent II. Fifty-two phenolic compounds are listed giving the color reaction with the reagent on thin-layer plates. (Holoman-Battelle)
W73-13169

THE GEOGRAPHIC DISTRIBUTION OF FRESHWATER HIRUDINOIDEA IN CANADA,
Calgary Univ. (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-13170

HYDROCARBONS IN THE PELAGIC SARGASSUM COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W73-13172

PARATHION EXPOSURE STUDIES. A GAS CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF LOW LEVELS OF P--NITROPHENOL IN HUMAN AND ANIMAL URINE,
Environmental Protection Agency, Perrine, Fla. Perrine Primate Lab.
D. E. Bradway, and T. M. Shafik.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 134-139, March 1973. 3 fig, 1 tab, 7 ref.

Descriptors: *Urine, *Methodology, Chemical analysis, Organic compounds, Animal metabolism Organophosphorus pesticides, Phosphothioate pesticides, *Gas chromatography, Solvent extractions, Public health, Absorption, *Phenols.
Identifiers: *Electron capture gas chromatography, *Nitrophenol, Sample preparation, Chemical recovery, Detection limits, Alkylation, Cleanup, Metabolites, Parathion, Biological samples, Excretion

A method for the determination of low levels of p-nitrophenol in rat and human urine was developed. The method involves acid hydrolysis of urine, extraction with benzene, derivatization of p-nitrophenol using an electron capture detector. Recoveries of fortified rat and human urine samples averaged in the range of 85-97 percent. The limits of detectability were 0.05 ppm for rat urine and 0.02 ppm for human urine. The method was applied to the analysis of p-nitrophenol in urine of rats exposed to 0.1 and 0.01 LD50 of parathion. (Holoman-Battelle)
W73-13174

GEOTHERMAL MERCURY POLLUTION IN NEW ZEALAND,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 05B
W73-13175

ELECTRON CAPTURE GAS CHROMATOGRAPHIC ANALYSIS OF DDA: UTILIZATION OF 2-CHLOROETHANOL DERIVATIVE,
Environmental Protection Agency, Perrine, Fla. Perrine Primate Lab.
M. F. Cranmer, and M. F. Copeland.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 186-192, March 1973. 1 fig, 3 tab, 2 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Chemical analysis, *Pollutant identification, DDT, Separation techniques, *Gas chromatography
Identifiers: *Electron capture gas chromatography, *DDA, Chemical recovery, Sample preparation, Metabolities, Derivatives, 2-Chloroethanol, Esterification, Cleanup, 2 2-Bis (p-chloropheny) acetic acid.

The use of the 2-chloroethanol derivative is reported in the electron capture gas chromatographic analysis of DDA (the carboxylic acid metabolite of DDT). The efficiency of conversion of DDA to the 2-chloroethanol derivative was 91.5 plus or minus 1.0 percent. The utilization of a silica gel column for clean up prior to electron capture analysis is discussed and the elution pattern for the 2-chloroethanol derivative is given with a recovery of 97.3 plus or minus 0.1 times more responsive to electron capture detection than the methyl ester of DDA and produces a retention time which separates the DDA from other chlorinated hydrocarbon pesticides which might interfere with the analysis. (Holoman-Battelle)
W73-13176

A SENSITIVE MECHANIZED DETERMINATION OF ATP PLUS ADP,
Netherlands Red Cross Blood Transfusion Service, Amsterdam. Central Lab.
J. A. Loos, R. C. H. van Doorn, and D. Roos.
Analytical Biochemistry, Vol 53, No 1, p 309-312, May 1973. 2 fig, 1 tab, 8 ref.

Descriptors: *Pollutant identification, Biochemistry, *Methodology, Enzymes, Filtration, Proteins, Centrifugation, Bioassay, Automation.
Identifiers: *ATP, *ADP, *Enzymatic tests, Sensitivity, Sample preparation, Blood, Biological samples, Sample preservation, NADH, Lymphocytes, Lysates, Erythrocytes.

A method for the mechanized determination of ATP plus ADP using a cyclic enzymatic system which was previously described has been improved to increase the sensitivity to 6 nm. The improved system differs in the way in which the conversion of ATP into ADP is measured and is based on the consumption of NADH. In the earlier

system it was necessary to free the enzyme mixture by filtration. It has been found now that all the commercially purified enzymes can be substituted by 'adolase paste' without changing the sensitivity or reproducibility. The new method yielded less than 5 percent difference with erythrocyte lysates when quenching of the fluorometric signal by haemoglobin was taken into account. With leukocytes, less than 10 percent difference was found. ATP added to these lysates was recovered quantitatively. This indicates that the determination is specific for ATP plus ADP in lysates of human erythrocytes and leukocytes. (Mortland-Battelle)
W73-13177

POLYCHLOROBIPHENYLS IN NORTH ATLANTIC OCEAN WATER,
Woods Hole Oceanographic Institution, Mass.
G. R. Harvey, W. G. Steinhauer, and J. M. Teal.
Science, Vol 180, No 4086, p 643-644, May 11, 1973. 1 tab, 10 ref.

Descriptors: *Polychlorinated ciphenylis, *Atlantic Ocean, *Sea water, Surface waters, Water analysis, *Pollutant identification, Organic compounds, Water pollution, Solvent extractions, Chemical analysis, Separation techniques, *Gas chromatography.
Identifiers: *Electron capture gas chromatography, On board analysis, Sample preparation, Sargasso Sea, Detection limits.

Concentrations of polychlorobiphenyls (PCB's) have been measured at the surface and at various depths in the water of the North Atlantic Ocean between 26 degrees N and 63 degrees N. Water samples were either extracted with a hexane-ether mixture, concentrated, and analyzed by electron capture gas chromatography (ECGC) or pumped through a brass or glass column packed with Amberlite XAD-2 resin, eluted with boiling acetonitrile, diluted with distilled water or seawater, extracted with hexane, concentrated and analyzed by ECGC. All analyses were completed on shipboard within 4 hours of sampling. Unfiltered seawater samples collected and analyzed simultaneously with water filtered through a 0.3-micron glass fiber filter or a glass wool plug contained a maximum of 10 percent more PCB than the filtered seawater samples. Three observations can be made from the data: (1) Although the range is very broad, the concentrations of PCB's in the northern North Atlantic average 35 ng/kg (35 parts per trillion (ppt)) in surface waters, and 10 ppt at 200 m. (2) The PCB concentrations decrease with depth. (3) The surface waters of the Sargasso Sea (stations 25-41) have slightly lower surface concentrations of PCB's (27 ppt) than surface waters in other parts of the North Atlantic. The widespread distribution of PCB's in the open North Atlantic supports previous observations that the atmosphere must be the predominant mode of transport. (Holoman-Battelle)
W73-13178

A SIMPLE COULOMETRIC METHOD FOR THE DETERMINATION OF CHLORIDE IN NATURAL WATER,
Oslo Univ., (Norway). Dept. of Chemistry.
E. Jacobsen, and G. Tandberg.
Analytica Chimica Acta, Vol 64, No 2, p 280-283, April 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Chlorides, *Water analysis, *Methodology, Chemical analysis, Electrolysis, Iodides, Bromides, Iron, Humus, Pollutant identification, *Volumetric analysis.
Identifiers: *Coulometry, *Natural waters, Detection limits, Ionic interference, Chemical interference, Cyanides, Thiocyanates.

A study was undertaken in order to construct a simple instrument for the coulometric titration of chloride in water. A very simple battery-operated constant-current source can be used for the titrations. Experiments showed that the current remained constant during the titration at all settings (0.1-4 mA). A 1-mm silver wire was used as generating electrode. The cathode (1-mm silver wire) was isolated in a glass tube with a fine-porosity fritted-glass disc. The shield tube was filled with the supporting electrolyte used in the sample solution. The end-point was determined by applying a constant current of about 1.1 microA between two treated silver wire electrodes and recording the potential-time curve with a strip-chart recorder. (Any kind of recorder with sensitivity in the range 1-10 mV/s can be used, provided that it is equipped with zero suppression). The proposed method is simple and rapid and gives satisfactory results in the range of 0.1-100 micrograms of chloride per ml. The method has the advantage that the blank is not affected by colored substances like iron and humus. Of common ions bromide, iodide, thiocyanate and cyanide interfere and must be absent from the solution; these ions interfere also in the spectrophotometric method. (Holoman-Battelle)
W73-13181

EXTRACTION AND GAS CHROMATOGRAPHIC DETERMINATION OF METHYL, -ETHYL-, AND METHOXYETHYLMERCURY (II) HALIDES,
Oak Ridge National Lab., Tenn.
J. A. Ealy, W. D. Shults, and J. A. Dean.
Analytica Chimica Acta, Vol 64, No 2, p 235-241, April 1973. 1 fig, 1 tab, 10 ref.

Descriptors: *Separation techniques, *Pollutant identification, *Solvent extractions, Sediments, Fish, Seeds, Chemical analysis, Plant tissues, Organic soils, Aquatic soils, Soil analysis, *Gas chromatography, *Halides.
Identifiers: Biological samples, *Organomercury compounds, *Mercury halide compounds, *Electron capture gas chromatography, Methylmercury halides, Ethylmercury halides, Methoxyethylmercury halides, Sample preparation, Chemical recovery, Reproducibility, Animal tissues, Methylmercury chloride, Ethylmercury chloride, Ethylmercury iodide, Methylmercury bromide, Partition coefficients, Methylmercury iodide, Ethylmercury bromide, Methoxyethylmercury chloride, Mercury radioisotopes, Hg-203.

The separation, identification, and determination of methyl-, ethyl-, and methoxyethylmercury (II) halides in biological materials were studied. The procedure developed involved a 24-h leach with 1 M sodium iodide, equilibration of the aqueous phase for 2 min with an equal volume of benzene, and then injection of an aliquot of the benzene phase onto a gas chromatographic column consisting of 5 percent cyclohexanedimethanol succinate held on Anakrom ABS. Excellent baseline separation of the chromatographic peaks was obtained. The extraction steps were monitored with RHgX compounds tagged with Hg-203. Partition coefficients are reported for methyl- and ethylmercury (II) chlorides, bromides, and iodides; several overall formation constants of the anionic complexes RHgCl sub n to the 1-n power (n equals 2,3) were determined. Results are reported for the recovery of methyl- and ethylmercury (II) halides from inoculated rye seed, humic and inorganic sediment, and fish grown in an aquarium. A single 24-h leach of 1-g samples gave the following D values: 12.0 plus or minus 0.2 for inorganic sediment; 7.7 plus or minus 0.5 for organic sediment; 5.6 plus or minus 0.8 for fish tissue; and 9.0 plus or minus 0.5 for rye seeds. (Holoman-Battelle)
W73-13182

THE NEW METHOD FOR THE DETERMINATION OF COBALT IN SEA WATER BY SOLVENT EXTRACTION WITH 2-NITROSO--5-DIETHYLAMINOPHENOL,
Okayama Univ. (Japan). Faculty of Science.
S. Motomizu.
Analytica Chimica Acta, Vol 64, No 2, p 217-224, April 1973. 4 fig, 4 tab, 16 ref.

Descriptors: *Cobalt, *Sea water, *Methodology, *Solvent extractions, *Pollutant identification, *Spectrophotometry, Water analysis, Chemical analysis, Heavy metals, Separation techniques, Hydrogen ion concentration, Ions, *Phenols.
Identifiers: 2-Nitroso-5-diethylaminophenol, Precision, Chemical interference, Reproducibility, Ionic interference, Sample preparation, Reagents, Complexation, EDTA, Absorption spectra, Organic solvents.

A method is described for determining cobalt in seawater spectrophotometrically by 2-nitroso-5-diethylaminophenol after extraction of the complex into 1,2-dichloroethane. This method eliminates preconcentration, requires relatively small volumes of sample solution, and provides simplicity and precision. The procedure was used in studying the effects of pH, shaking time, standing time and amounts of the reagent added on the extraction of cobalt. The optimal pH range was 4.5-8.5 for distilled water containing 0.24 microgram of cobalt, but 5.5-7.5 for sea waters. The minimal shaking time was 6 min in both cases, and a time of 10 min was selected for certainty. The standing time necessary for development of the complex was only 10 min, but a period of 30 min was considered advisable. When distilled water containing 0.24 microgram of cobalt was used, maximal absorbance was obtained with a reagent addition of 10 ml of 0.2 percent solution per liter. Those metal ions that are extracted along with the cobalt complex can be stripped completely with HCl, thus eliminating interference. Other metal ions and anions existing commonly in seawater do not interfere. The method is applicable over the range 0-0.24 microgram Co/l when 1-l or 2-l samples are taken. The relative standard deviation is 4 percent for 0.15 microgram Co/l. The stability of cobalt in sea water samples is discussed. (Holoman-Battelle)
W73-13183

A SIMULTANEOUS DETERMINATION OF LEAD-210 AND POLONIUM-210 IN SEA WATER,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries.
Y. Nozaki, and S. Tsunogai.
Analytica Chimica Acta, Vol 64, No 2, p 209-216, April 1973. 6 fig, 2 tab, 7 ref.

Descriptors: *Sea water, *Radiochemical analysis, *Methodology, *Water analysis, Chemical analysis, *Lead radioisotopes, Radioactivity, Chemical precipitation, Heavy metals, Pollutant identification, Pollutants.
Identifiers: Pb-210, Po-210, *Polonium radioisotopes, Sample preparation, Alpha spectrometry, Coprecipitation, Accuracy.

A simpler and more precise method is described for the determination of lead-210 and polonium-210 in seawater. In the proposed method, these nuclides are coprecipitated with calcium carbonate and then polonium is selectively separated from other nuclides by spontaneous deposition onto a silver disc. The content of lead-210 is measured by the activity of its granddaughter, polonium-210, produced during the storage of the sample containing lead-210 for more than 3 months. In the development of this method, particular caution was taken to avoid the adsorption loss of polonium-210 onto the wall of the container used during analysis and storage. Replicate analyses done on about 45-l seawater samples gave a counting error of about plus or minus 10 percent for Po-210 stored for about 5 months. Seawater samples collected from the North Pacific Ocean during the cruise of R/V Hakuho-maru, KH-71-3 in 1971 analyzed by the above procedure showed that the ratios of Po-210 to Pb-210 were smaller than unity in the surface layer of the ocean. (Holoman-Battelle)

W73-13184

A POTASSIUM-SELECTIVE SILICONE--RUBBER MEMBRANE ELECTRODE BASED ON A NEUTRAL CARRIER,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
J. Pick, K. Toth, and E. Pungor.
Analytica Chimica Acta, Vol 64, No 3, p 477-480, May 1973. 2 fig, 3 tab, 19 ref.

Descriptors: *Selectivity, *Cations, Aqueous solutions, Alkali metals, *Alkaline earth metals, Potassium, Hydrogen, Sodium, Cesium, Calcium, Strontium, Magnesium.
Identifiers: *Ion selective electrodes, *Membrane electrodes, *Potassium electrodes, Ligands, Valinomycin, *Electrochemical behavior, Electromotive force, Response time, Reproducibility, Ionic interference, Barium, Lithium, Ammonium, Rubidium.

A new potassium-selective silicone-rubber membrane electrode based on the neutral carrier valinomycin has been developed. The electrode selectivity for most alkali and alkaline earth metal cations is comparable to that of the conventional liquid membrane electrodes. Over a period of 65 h no drift in e.m.f. was observed. The response time usually is less than 3 s. (Holoman-Battelle)
W73-13185

THE DETERMINATION OF SELENIUM IN SEA WATER BY GAS CHROMATOGRAPHY WITH ELECTRON-CAPTURE DETECTION,
Okayama Univ. (Japan). Faculty of Science.
Y. Shimoishi.
Analytica Chimica Acta, Vol 64, No 3, p 465-468, May 1973. 2 fig, 1 tab, 7 ref.

Descriptors: *Sea water, *Water analysis, *Methodology, *Gas chromatography, Chemical analysis, Pollutant identification, Pollutants, Solvent extractions, Separation techniques.
Identifiers: *Electron capture gas chromatography, *Selenium, Sample preparation, Detection limits, 4-Nitro-o-phenylenediamine hydrochloride.

A direct gas chromatographic method is described for the determination of selenium in seawater without preconcentration. A volume of seawater and HCl were combined in a separatory funnel to which was added 1 percent 4-nitro-o-phenylenediamine solution. This mixture was allowed to stand for 2 hr and the 5-nitropiaselenol formed was extracted into toluene by shaking for 5 min. The toluene extract was washed with 7.5 M HCl and 5-microliter aliquots were injected into a gas chromatograph equipped with an electron capture detector, and the peak height measured. Seawater samples were prepared for the procedure by membrane filtration and shaking with toluene to extract toluene-soluble material. This caused no loss in Se. Analysis of seawater samples showed an average Se content of 0.04-0.08 plus or minus 00.01 microgram/l. As even about 0.002 microgram of selenium in 1 ml of organic extract can be detected by this procedure, only 50-100 ml of seawater is needed. (Holoman-Battelle)
W73-13186

ION-SELECTIVE CARBON-PASTE ELECTRODES FOR HALIDES AND SILVER (I) IONS,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Technology.
S. Mesaric, and E. A. M. F. Dahmen.
Analytica Chimica Acta, Vol 64, No 3, p 431-438, May 1973. 4 fig, 3 tab, 19 ref.

Descriptors: *Halides, *Cations, *Aqueous solutions, *Fabrication, Silver iodide, Measurement, Heavy metals, Halogens, Volumetric analysis, Chemical analysis, Pollutant identification, Instrumentation, Hydrogen ion concentration.
Identifiers: *Silver, *Ion selective electrodes, *Carbon paste electrodes, Potentiometric titration, Silver chloride, Silver bromide, Potentiometry, Chemical interference, Detection limits, Silver chloride/silver sulfide electrodes, Silver bromide/silver sulfide electrodes, Silver iodide/silver sulfide electrodes.

The behavior of a simple type of ion-selective electrode for halogens and silver has been studied. The electrode consists of a plastic body filled with carbon paste, the surface of which can be easily renewed. The paste composition is based on carbon-nujol (5:1, w/v) or carbon-paraffin wax (3:1, w/w) containing a prepared mixture of silver halide-silver sulphide (1-30 percent). The electrodes have low ohmic resistance and show a rapid Nernstian response (within 2-5 mV) for halide and silver ions down to 0.05 mM chloride, 0.01 mM bromide and 0.5 microM iodide with the respective electrodes. Ions forming very stable complexes with halide or silver and those having strong oxidizing or reducing action interfere. (Holoman-Battelle)
W73-13187

THE CALIBRATION AND RESPONSE OF ION--SELECTIVE ELECTRODES AT LOW CONCENTRATIONS OF PRIMARY IONS,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
For primary bibliographic entry see Field 02K.
W73-13188

RECENT RESULTS ON THE DYNAMIC RESPONSE OF PRECIPITATE-BASED ION--SELECTIVE ELECTRODES,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
For primary bibliographic entry see Field 02K.
W73-13189

A RUGGED SILVER-SILVER CHLORIDE ELECTRODE FOR FIELD USE,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
For primary bibliographic entry see Field 07B.
W73-13193

ERRORS OF MEASUREMENT, PRECISION, ACCURACY AND THE STATISTICAL COMPARISON OF MEASURING INSTRUMENTS,
Army Ballistic Research Labs., Aberdeen Proving Ground, Md.
For primary bibliographic entry see Field 07A.
W73-13194

SOME PROBLEMS ASSOCIATED WITH THE ANALYSIS OF MULTIRESPONSE DATA,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 07C.
W73-13195

SOME PROCEDURES FOR ISOLATING TOXIC METABOLITES OF PHOSPHOROTHIONATE PESTICIDES FROM ANIMAL TISSUES AND FLUIDS,
Ministry of Agriculture, Fisheries and Food, Weybridge (England). Central Veterinary Lab.
A. F. Machin.
Proceedings of the Society for Analytical Chemistry, Vol 10, No 4, p 92-93, April 1973. 10 ref.

Descriptors: *Phosphothioate pesticides, Methodology, *Chemical analysis, *Isolation, *Diazinon, Organophosphorus pesticides, Insecticides, Gas chromatography, Separation techniques, Pollutant identification, Mass spectrometry, Urine, Pesticide toxicity, Pollutants, *Chromatography.
Identifiers: *Metabolites, *Animal tissues, Body fluids, Thin layer chromatography, Column chromatography, High pressure liquid chromatography, Thiolates, Thermionic gas chromatography, Sensitivity, Thionates

The chromatographic procedures used in separating the metabolites of diazinon, together with some more recent improvements, are discussed. The methods, which include thin-layer, gas-column and high-pressure liquid chromatography, are thought to be generally applicable to metabolites of phosphorothionate pesticides. Thin-layer chromatography is useful both for recognizing toxic metabolites by their inhibition of esterases and for isolating them. Gas chromatography is used extensively for detecting metabolites that contain phosphorus, determining residues and monitoring the progress of purification. A thermionic detector is generally used: its high and selective sensitivity probably makes it more suitable than the specific but less sensitive flame-photometric detector. Gas chromatography is convenient for isolating metabolites in microgram amounts for mass spectrometry, for which purpose an instrument designed especially for the collection of labile compounds is used. It is not satisfactory for purifying the much larger amounts needed for nuclear magnetic resonsance measurements, however, owing to the difficulty of collecting large fractions quantitatively. Column chromatography is tedious but so far has been the only way to separate dehydrodiazinon from the much larger amounts of diazinon and fat which accompany it. High-pressure liquid chromatography is now being used for some of the isolations. Simple equipment, including a pump built at the author's laboratory, is used with a commercial ultraviolet detector. (Holoman-Battelle)
W73-13196

POTENTIOMETRIC STUDIES ON THIOACETAMIDE BY MEANS OF A SULPHIDE ION-SELECTIVE MEMBRANE ELECTRODE,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
M. K. Papay, K. Toth, V. Izvekov, and E. Pungor.
Analytica Chimica Acta, Vol 64, No 3, p 409-415, May 1973. 12 fig, 2 ref.

Descriptors: *Chemical analysis, *Aqueous solutions, *Pollutant identification, Inorganic compounds, *Volumetric analysis, Hydrogen ion concentration, Chemical precipitation, Methodology.
Identifiers: *Thioacetamide, *Potentionmetric titration, *Ion selective electrodes, *Sulfide electrodes, Silver nitrate, Ultraviolet spectra, Infrared spectra, Membrane electrodes, Silver sulfide.

The sulphide ion-selective electrode has been found to be applicable to the determination of thioacetamide in the concentration range of 0.1-0.001 M by direct potentiometry and titration with silver nitrate. The effects of the acid and alkali content of the solutions on the titration reaction have been studied. In alkaline and slightly acidic solutions the product of the reaction is silver sulphide; in solutions in which the acid concentration exceeds 0.5 M, a precipitate of silver thioacetamide is formed. If the alkali concentration of the solution is lower than that corresponding to the amount of acid formed during the titration, another potential jump occurs before the endpoint owing to the decrease of sulphide concentration governed by hydrolysis. (Holoman-Battelle)
W73-13197

ATOMIC ABSORPTION INHIBITION TITRATION OF ORTHOPHOSPHATE AND POLYPHOSPHATES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
W. E. Crawford, C. I. Lin, and C. O. Huber.
Analytica Chimica Acta, Vol 64, No 3, p 387-395, May 1973. 4 fig, 4 tab, 13 ref.

Descriptors: *Aqueous solutions, *Water analysis, *Phosphates, Chemical analysis, *Volumetric analysis, Methodology, Anions, Surface waters, Silicates, Waste water (Pollution), Sulfates, Detergents, Pollutant identification, Water pollution.
Identifiers: *Polyphosphates, *Orthophosphates, *Atomic adsorption spectrophotometry, Total consumption burner, Premix burner, Inhibition titration, Sensitivity, Gas flow rates, Accuracy, Chemical interference, Ionic interference.

The atomic absorption inhibition titration of phosphates was studied for two types of burner. It involves titration of the anion solution with a metal cation solution while the atomic absorption signal for the metal is monitored. Magnesium was selected as the monitor metal because of its sensitivity for measurement and the high extent of inhibition by refractory forming anions. The anions selected in this study are ortho-, pyro-, tetra- and hexaphosphates. Observations were made with both total consumption and pre-mix slot burners. A hydrogen-air flame was used in order to have the relatively low flame temperatures and the flame temperature control which are necessary. The method with a pre-mix burner was used to determine phosphate in surface and waste waters. The results compared quite favorably with those by the standard method. The proposed method was found to be rapid, simple and accurate. A complete manual titration curve was obtained in less than 30 min and semi-automatic titration required less than 5 min. (Holoman-Battelle)
W73-13198

THE DETERMINATION OF MOLYBDENUM IN SEA WATER BY HOT GRAPHITE ATOMIC ABSORPTION SPECTROMETRY AFTER CONCENTRATION ON P-AMINOBENZYLCELLULOSE OR CHITOSAN,
Bologna Univ. (Italy). Ciamician Chemical Inst.
R. A. A. Muzzarelli, and R. Rocchetti.
Analytica Chimica Acta, Vol 64, No 3, p 371-379, May 1973. 4 fig, 4 tab, 14 ref.

Descriptors: *Molybdenum, *Sea water, *Chemical analysis, *Separation techniques, *Chelation, Cations, Water analysis, Methodology, Anions, Pollutant identification, Heavy metals, Chromium, Manganese, Iron, Mercury, Lead, Nickel, Cadmium, Titanium, Cobalt, Zinc, Magnesium, Calcium, Aluminum, Phosphates.
Identifiers: *Hot graphite atomizer, *Atomic absorption spectrophotometry, Preconcentration, p-Aminobenzylcellulose, Chitosan, Chemical interference, Tin, Arsenic, Silver, Diethylaminoethylcellulose, Antimony, Uranyl, Dowex A-1, Dowex -X8, Chelating agents.

A comparative study of the chelating ability of chitosan, p-aminobenzylcellulose and diethylaminoethylcellulose, for a number of metal ions is discussed. There is a strong interaction between molybdenum and these polymers in thiocyanate solutions and in sea water. By combining the sensitivity of graphite-furnace atomic absorption spectrometry with the efficiency of the selective collection of molybdenum on p-aminobenzylcellulose of chitosan at pH 2.5, it was possible to determine molybdenum in as little as 50 mg of sea water. (Holoman-Battelle)
W73-13199

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-13200

ISOTOPHIC TRACER TECHNIQUES FOR IDENTIFICATION OF SOURCES OF NITRATE POLLUTION,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
For primary bibliographic entry see Field 05B.
W73-13201

WATER RESOURCES OF BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02A.
W73-13209

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (V): PELAGIC POLYCHAETES OF THE CENTRAL ARCTIC BASIN,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
D. R. Yingst.
Available from the National Technical Information Service as AD-756 659, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 1, October 1972. 49 p, 49 fig, 30 ref, 1 append. 307-270. Contract No N00014-67-A-0269-0013.

Descriptors: *Zooplankton, *Arctic Ocean, *Annelids, *Systematics, *Classification, Larvae, Arctic, Invertebrates, Animal groupings.
Identifiers: *Polychaetes, *Pelagic animals, *Taxonomic guides, Animal morphology, Sample preservation, Macroinvertebrates, Antinoella spp, Macellicephala spp, Pelagobia longicirrata, Typhloscolex spp, Rhynchonerella spp, Vanadis tagensis, Phalacrophorus spp, Tomopteris spp, Travisiopsis lobifera.

A series of six practical taxonomic guides to zooplankton was prepared to meet the needs of non-taxonomists involved with Arctic fauna. The work is based upon results of research by investigators associated with the USC Arctic Project and its precursors since 1952. This compilation presents a detailed consideration of the different adult pelagic polychaetes found in the central Arctic Ocean. Emphasis has been placed on the familial level as information on the group is still inadequate to justify construction of generalized keys to species. Provided also are a discussion of basic polychaete morphology and terminology used in the guide, illustrations, dichotomous keys, and hints on methodology for handling preserved specimens. Selected references pertaining to polychaetes in general, as well as those concerning specific polychaetes in the guide, are included. (Holoman-Battelle)
W73-13233

SEPARATION OF MANGANESE, IRON, COBALT, NICKEL, COPPER, ZINC AND CADMIUM BY REVERSED-PHASE CHROMATOGRAPHY USING TRI-N-OCTYLAMINE AS THE STATIONARY PHASE AND APPLYING A GRADIENT ELUTION TECHNIQUE, (EXTRAKTIONSCHROMATOGRAPHISCHE TRENNUNG VON MANGAN, EISEN, KOBALT, NICKEL, KUPFER, ZINK UND CADMIUM UNTER VERWENDUNG VON TRI-N-OCTYLAMIN ALS STATIONARE PHASE UND GRADIENTELUTION),
Deutsche Akademie der Wissenschaften zu Berlin, Dresden (East Germany). Central Inst. for Solid Matter Physics and Raw Materials Research.
B. Neef, and H. Grosse-Ruyken.
Journal of Chromatography, Vol 79, p 275-285, May 16, 1973. 8 fig, 3 tab, 20 ref.

Descriptors: *Manganese, *Iron, *Cobalt, *Nickel, *Copper, *Zinc, *Cadmium, *Separation techniques, *Heavy metals, *Chromagraphy.
Identifiers: Reversed phase chromatography, Distribution coefficients, Chromatograms.

A procedure is described for the separation of manganese, iron, cobalt, nickel, copper, zinc and cadmium by means of reversed-phase chromatography. The distribution coefficients of these elements were determined by extraction with tri-n-octylamine-benzene (1:1) solution from hydrochloric acid and hydrochloric acid-nitric acid mixtures. In addition, the influence of particle size, degree of loading of silica gel with tri-n-octylamine, flow-rate and temperature on the height of effective theoretical plate was investigated. A gradient apparatus which was developed for this kind of separation is described; by insertion of circuitous tubes between the mixing vessels and the column head, a concentration gradient can be obtained for the eluent that is partly constant and partly decreased. (Little-Battelle)
W73-13234

GAS CHROMATOGRAPHY OF TL, SE, TE, HG, AS, SB, BI, SN AS PHENYL COMPOUNDS, (GAS-CHROMATOGRAPHIE VON TL, SE, TE, HG, AS, SB, BI, SN ALS PHENYLVERBINDUNGEN),
Tieraerztlichen Hochschule, Hanover (West Germany). Chemical Inst.
G. Schwedt, and H. A. Russel.
Zeitschrift fur Analytische Chemie, Vol 264, No 4, p 301-303, May 7, 1973. 2 fig, 1 tab, 3 ref.

Descriptors: *Heavy metals, *Gas chromatography, *Methodology, *Pollutant identification, Organic compounds, Mercury, Separation techniques, Chemical analysis, Solvent extractions.
Identifiers: *Organometallics, *Rare earth elements, Thalluim, Selenium, Tellurium, Arsenic, Antimony, Bismuth, Tin, Mercury diphenyl, Thallium triphenyl, Complexation, Selenium diphenyl, Tellurium diphenyl, Arsenic triphenyl, Antimony triphenyl, Bismuth triphenyl, Tin tetraphenyl.

The phenyl compounds of thallium, selenium, tellurium, mercury, arsenic, antimony, bismuth and tin are suitable for the analysis of these elements by gas chromatography. They are produced quantitatively except thallium triphenyl when the diethyldithiocarbamates, which are extracted out of acid solution, are reacted with magnesium organic compounds. By gas chromatography the phenyl compounds of all eight elements are separated with one column by utilizing a temperature program. In case of mercury diphenyl complete elution could not be realized. (Holoman-Battelle)
W73-13235

APPARATUS FOR SEMI-CONTINUOUS CULTURE OF DAPHNIA,
A. M. Harvey.
Laboratory Practice, Vol 22, No 2, p 114-115, February 1973. 1 fig, 11 ref.

Descriptors: *Daphnia, Sampling, Zooplankton, Laboratory equipment, Crustaceans.
Identifiers: *Chemostat, *Culturing vessels, *Culturing techniques, Macroinvertebrates.

An apparatus for culturing Daphnia, which employs some advantage of the chemostat is described. Two-litre culture vessels with a 14 mm bottom port are used. A delicate agitator is used involving moist, sterile air bubbling through a sintered glass disc into an inverted funnel inside the culture vessel. This provides satisfactory mixing and alleviates localization of metabolic wastes and oxygen deficiency. The vessel is autoclaved at 15 pounds per square inch for 15 minutes, and then joined aseptically to sterile food and air lines in a controlled temperature room at 20C. A suspension of 150,000 cells per ml of Chlorella vulgaris is pumped into the culture vessel to a volume of 1200 ml. Sterile, clonal Daphnia pulex are introduced and the agitation system activated. The culture is allowed to increase and equilibrate for six days, and the pump is switched on again to give the desired dilution rate. Although this apparatus necessarily falls short of a true chemostat in some respects of its design, it represents a much more satisfactory method than previous ones used for culturing Daphnia. The main advantages are of constancy in the environment, simplicity of con-

trol, and physiological uniformity. The methods used to minimize particular problems presented by Daphnia could easily be modified to allow the culture of other aquatic invertebrates in a similar system. (Mortland-Battelle)
W73-13239

ANALYSIS OF ORGANIC CONSTITUENTS PRESENT IN DRINKING WATER,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Petroleum Technology and Petrochemistry.
J. Novak, J. Zluticky, V. Kubelka, and J. Mostecky.
Journal of Chromatography, Vol 76, p 45-50, February 7, 1973. 3 fig, 2 tab, 10 ref.

Descriptors: *Separation techniques, *Organic compounds, *Potable water, Gas chromatography, Mass spectrometry, Water analysis, Solvent extractions.
Identifiers: *GC-Mass spectometry, Detection limits, *Organic solvents, *Inert gases, *Gas bubbling, Pentene, Cyclopentane, Cyclopentene, Cyclohexane, Methylcyclopentane, Cyclopentadiene, Cyclohexene, Isobutanal, Tetrachloromethane, Benzene, Trichloromethylene, Chloroform, Tetrachlorethylene, Toluene, Dichloroethane, Xylene, Chlorinated hydrocarbons, Chromatograms.

Polluted drinking water was extracted with carbon tetrachloride or nitrobenzene and the extracts were analyzed by GC-mass spectrometry. The UV and IR spectra were also recorded. A further extraction procedure consisted of bubbling an inert gas (helium) through the water and analyzing by GC-MS. The carbon tetrachloride and nitrobenzene extracts did not reveal the presence of any organic compounds; however, when the inert gas was bubbled through the water, several organic compounds were detected. These were C1-C4 hydrocarbons, pentene, cyclopentane, cyclopene, and methylcyclopentane, cyclopentadiene, cyclohexane, cyclohexene, isobutanal, tetrachloromethane, benzene, trichloromethylene, chloroform, tetrachloroethylene, toluene, dichloroethane, and xylene. Although the source of the compounds was not determined, it was concluded that the limit of detection with bubbling inert gas through the sample is two to three orders higher than with extraction by organic solvents. One limitation of the method is that substances which boil above 100C cannot be determined. (Little-Battelle)
W73-13240

MASS SPECTROMETRIC DETERMINATION OF DIETHYLDITHIOCARBAMATES,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
B. C. Wood, and R. K. Skogerboe.
Applied Spectroscopy, Vol 27, No 1, p 10-12, January/February 1973. 2 fig, 23 ref.

Descriptors: *Heavy metals, *Mass spectrometry, Methodology, Aqueous solutions, *Pollutant identification, Chemical analysis, Cadmium, Copper, Lead, Zinc, Solvent extractions, Chelation, *Carbamate pesticides.
Identifiers: *Metal chelates, *Diethyldithiocarbamates, Direct insertion probe, Sample preparation, Organic solvents, Arsenic, Reproducibility, Mass spectra, Detection limits, Accuracy.

The determination of diethyldithiocarbamate chelates of As, Cd, Cu, Pb, and Ln by direct insertion probe mass spectrometry is reported. Extractions directly into the diethylammonium diethyldithiocarbamate-methyl isobutyl ketone (DADDC-MIBK) solutions were carried out at the appropriate pH by the procedures outlined by Joyner and Finley (1966), Nix and Goodwin (1970), and Trujillo (1971). The extracts were stored in clean vials from which microliter quantities were delivered to the quartz sample holder of the direct insertion probe. The measurements made on the above elements were generally reproducible to plus or minus 10 percent. Assuming an instrument blank of 1 ng, each of these elements can be determined at levels ranging from 0.5 to 1 ng via this technique. Such determination capabilities are equivalent to 0.01 ppm in a 10-ml aqueous sample extracted into 1 ml of MIBK using a 10-microliter sample of the extract for the analysis. (Holoman-Battelle)
W73-13241

MICROMETHOD SYSTEM FOR IDENTIFICATION OF ANAEROBIC BACTERIA,
Center for Disease Control, Atlanta, Ga. Lab. Div.
S. E. Starr, F. S. Thompson, V. R. Dowell, Jr., and A. Balows.
Applied Microbiology, Vol 25, No 5, p 713-717, May 1973. 3 tab, 8 ref.

Descriptors: *Anaerobic bacteria, *Pollutant identification, *Methodology, Chemical reactions, Reduction (Chemical), Cultures, Nitrates, Nitrites, Hydrolysis, Ureas, Fermentation, Hydrogen sulfide, Carbohydrates, Laboratory tests, Speciation.
Identifiers: *Micromethod system, *Method evaluation, *Comparative tests, Culture media, Substrate utilization, Biochemical tests, Bacterial physiology, Gas liquid chromatography, Indoles, Nutrient media, Substrates, Ehrlich reagent, Kovac reagent, Blood agars, Bacterioides spp, Clostridium spp, Fusobacterium spp, Lactobacillus catenaforme, Propionibacterium acnes, Propionibacterium granulosum, Glucose, Mannose, Mannitol, Lactose, Sucrose, Maltose, Salicin, Glycerol, Xylose, Arabinose, Starch, Esculin, Gelatin, Fusobacterium necrophorum, Peptostreptococcus, Bifidobacterium, Eubacterium lentum, Peptococcus.

A micromethod multitest system was compared with conventional tests for identification of anaerobic bacteria. The micromethod system includes tests for neutral red and nitrate reduction; H2S, urease, and indole production; hydrolysis of gelatin and esculin; and fermentation of glucose, mannose, fructose, galactose, mannitol, lactose, sucrose, maltose, salicin, glycerol, xylose, arabinose, and starch. All procedures were conducted in an anaerobic glove box. A total of 104 cultures, including 18 reference strains and 86 diagnostic cultures, were examined. Ninety-one percent of the total tests performed with the two systems were in agreement. Greater than 90 percent agreement between the two systems was obtained with 12 of the 17 differential tests compared. The tests for nitrate reduction and H2S production gave the poorest agreement, 77.8 and 80.8 percent, respectively. Only 66 percent of the 86 diagnostic cultures could be presumptively identified with the micromethod system supplemented only with microscopy and colonial characteristics. However, when appropriate supplementary tests and gas-liquid chromatography were used with the micromethod system, 85 percent of the 86 strains could be identified. When Ehrlich reagent, instead of Kovac reagent, was used with the micromethod to test for indole, the agreement in identification was raised to 93 percent. (Mortland-Battelle)
W73-13242

FRITTED DISC FUNNELS AND TAPERED STAINLESS STEEL TUBES AND STOPPERS FOR USE IN PESTICIDE RESIDUE ANALYSIS,
Canadian Grain Commission, Winnipeg (Manitoba). Grain Research Lab.
I. Levi, and T. W. Nowicki.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 1, p 20-23, January 1973. 2 fig, 1 ref.

Descriptors: *Pesticide residues, *Filtration, Laboratory equipment, *Filters, *Tubes, Mechanical equipment, Gas chromatography, Separation techniques, Crops, Wheat, Barley
Identifiers: Chemical interference, Sample preparation, Funnels, *Gas liquid chromatography, Biological samples, Fritted discs.

Teflon and other gaskets in blender-extractor apparatus and filter papers give rise to interfering GLC peaks during analysis of pesticide residues in wheat and barley. Two pieces of equipment were developed to avoid these problems. The first was a fritted disc funnel for filtering residue extractions. It consists of a pyrex funnel fitted with a 50 mm diameter medium porosity fritted disc which is annealed to the funnel. The funnel requires suction. The second piece of equipment is a stainless steel tapered tube and stopper assembly which requires no gaskets. Schematic drawings of the tube and stopper are included. (Little-Battelle)
W73-13246

EFFECTS OF FIXATION ON THE EXTRACTION OF DIELDRIN AND P,P'-DDT FROM MUSCLE TISSUE,
Massachusetts Univ., East Wareham. Lab. of Experimental Biology.
K. H. Deubert, J. S. Timmerman, and L. R. McCloskey.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 1, p 54-56, January 1973. 1 tab, 3 ref.

Descriptors: *Separation techniques, *Freshwater fish, *Marine fish, *Dieldrin, *DDT, *Pesticide residues, Brook trout, Smelts.
Identifiers: *Sample preservation, Formalin, Biological samples, Fixation, *Muscle, Bouin's fixative, p p'DDT, Cod (Fish), Animal tissues.

Samples of muscle tissue were taken from codfish, smelt, and brook trout and fixed in formalin or Bouin's fixative to study the effect of fixation on extraction of dieldrin and p,p'-DDT. Frozen samples were used for reference. The results indicate that the use of formalin or Bouin's mixture does not affect the extractability of p,p'-DDT and dieldrin at the low levels occurring in environmental samples. As well, the results indicate that tissue samples fixed in Bouin's solution for histological studies can still be used for dieldrin and DDT analysis. (Little-Battelle)
W73-13247

RESIDUES OF DDT IN COD FROM NORWEGIAN FJORDS,
Norges Veterinarhoegskole, Oslo. Dept. of Pharmacology and Toxicology.
J. E. Bjerk.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 89-97, February 1973. 1 fig, 3 tab, 16 ref.

Descriptors: *Gas chromatography, *Pesticide residues, *DDT, Water pollution sources, *Lipids, Separation techniques, Runoff, DDD, DDE, Water pollution effects, Growth rates, Size, Absorption, Orchards, Path of pollutants, Water pollution effects, Marine fish.
Identifiers: *Liver, *Muscle, *Cod (Fish), Biological samples, o p'DDT, p p' DDT, Gadus morhua, Sample preparation, Norway.

Samples of cod from four fiords located at the south-western coast of Norway were analyzed for DDT residues by GC. At locality A there were large fruit orchards and a small forest nursery. At C there were fruit orchards, while at B there was a forest nursery only. The fourth locality, D, had no known source of contamination. At A samples were collected at intervals during the spring of 1970. The DDT content in cod liver in samples from A and C was high. The mean values of 10-15 specimens ranged between 12 and 40 ppm, calcu-

ted on a wet weight basis, and between 26 and 99 pm, calculated on the basis of extractable lipids. hree specimens of cod showed residue levels of 0-135 ppm DDT in liver tissue. DDT values in cod om the two other localities were less than 5 ppm. he specimens from A were caught at three sub- calities, and it was found that DDT levels ecreased with increased distance from the head the fiord, where the majority of fruit orchards ere located. Significant correlations were found tween fish size and DDT content in liver tissue, t not in the sample from locality D. The correla- ns were destroyed during the spring breakup, e DDT content increasing during this period. p'-DDT was also found in samples taken during ay and June. The high DDT levels were at- buted to the runoff from fruit orchards located steep slopes in this mountainous area. (Little- ttelle)
73-13249

ATTY ACID COMPOSITIONS OF ARACOLONS: ARIZONA, CITROBACTER, ND PROVIDENCIA,
rnell Univ. Medical Coll., New York. Dept. of icrobiology.
r primary bibliographic entry see Field 05C.
73-13252

TOMIC EMISSION SPECTROMETRY WITH N INDUCTION-COUPLED HIGH-FREQUE- CY PLASMA SOURCE. THE DETERMINA- ION OF IODINE, MERCURY, ARSENIC AND ELENIUM,
perial Coll. of Science and Technology, London ngland). Dept. of Chemistry.
F. Kirkbright, A. F. Ward, and T. S. West.
nalytica Chimica Acta, Vol 64, No 3, p 353-362, ay 1973. 4 fig, 2 tab, 14 ref.

escriptors: *Iodine, *Mercury, *Aqueous solu- ns, Cations, Anions, Heavy metals, Chemical alysis, Alkali metals, Alkaline earth metals, alogens, Cobalt, Chromium, Copper, Iron, Zinc, olybdenum, Nickel, Phosphates, Chlorides, anganese, Sodium, Fluorides, Nitrates, lfates, Aluminum, Calcium, Potassium, Mag- sium, Iodides, Pollutant identification.
entifiers: *Arsenic, *Selenium, *Atomic emis- n spectrophotometry, High frequency plasma urce, Induction-coupled plasma source, Spec- l interference, Detection limits, Tin, Acetates, mmonium.

e application is reported of an inductively cou- ed high-frequency plasma source to the deter- ination of arsenic, iodine, mercury and selenium aqueous solution by atomic emission spec- metry at wavelengths less than 200 nm. In the paratus used, only a simple indirect nebulizer d expansion chamber are used to introduce ueous sample solutions into the plasma. Optimal nditions have been established, and the spectral terference effects at different atomic lines for ch element have been investigated. With the pe of instrumentation employed, the determina- n of iodine at 183.04 nm, mercury at 184.96 nm, senic at 189.0 nm and selenium at 196.09 nm is commended to minimize spectral interferences. o chemical or physical interferences resulting om the influence of foreign ions on the solute porization process have been noted. (Holoman- ttelle)
73-13254

RECISE SHIPBOARD DETERMINATION OF ISSOLVED NITROGEN, OXYGEN, ARGON, ND TOTAL INORGANIC CARBON BY GAS HROMATOGRAPHY,
stitution of Oceanography, La Jolla, Calif.
F. Weiss, and H. Craig.
eep-Sea Research and Oceanographic Abstracts, ol 20, No 4, p 291-303, April 1973. 5 fig, 25 ref.

Descriptors: *Dissolved oxygen, *Gas chromatography, *Sea water, *Chemical analysis, Water analysis, Instrumentation, Calibrations, Methodology, Pollutant identification, On-site data collections, On-site investigations, *Nitrogen, *Carbon, *Argon.
Identifiers: *Shipboard measurements, Dissolved nitrogen, Dissolved carbon, Dissolved argon, On board analysis, Dissolved gases, Thermal conductivity gas chromatography, Precision, Accuracy, Winkler method.

A seagoing gas chromatographic system for the rapid and precise determination of dissolved gases in sea water is described. Separate instruments are employed for total inorganic carbon, and for nitrogen, oxygen, and argon analyses. Factors affecting the design, calibration, and shipboard operation of the system are discussed in detail. Results of intercomparisons with other analytical techniques confirm the accuracy of the gas chromatographic method. Profiles of sigma CO2, 02, and N2 measured aboard ship are presented and discussed. (Holoman-Battelle)
W73-13255

HYDROCARBONS FROM SEA WATER,
Centre National de la Recherche Scientifique, Paris (France).
M. Barbier, D. Joly, A. Saliot, and D. Tourres.
Deep-Sea Research and Oceanographic Abstracts, Vol 20, No 4, p 305-314, April 1973. 9 fig, 2 tab, 16 ref.

Descriptors: *Sea water, *Mass spectrometry, *Water analysis, Chemical analysis, *X-ray fluorescence, *Pollutant identification, Atlantic Ocean, Organic matter, *Organic compounds, Sampling, Isolation, Solvent extractions, Separation techniques, Friction.
Identifiers: *Dissolved organic matter, *Gas liquid chromatography, n-Paraffins, Coastal waters, Fatty acids, Sterols, Mass spectra, Sample preparation, Chlorinated hydrocarbons, Hexachlorocyclohexane, Hexachlorodiphenyl.

Dissolved hydrocarbons have been extracted by means of chloroform, from coastal and open sea waters; after isolation of the unsaponifiable fraction and preparative thin-layer chromatography, they were analyzed by gas-liquid chromatography and mass spectrometry. Hydrocarbons represent ca 20 percent of the total extracts; concentrations may vary from 10 to 140 micrograms 1. N-Paraffins occur to an extent of ca 12 percent, from n-C14 to n-C37, with a maximum at n-C27 to n-C30; odd carbon paraffins are not predominant. Sea waters of different origins (collected at depths of as much as 4500 metres) show a similar composition in dissolved hydrocarbons; this composition does not differ much from the hydrocarbons usually found in algae. A probable hypothesis is that sea-water hydrocarbons originate from the micro-or macro phytoplankton. Coastal waters clearly indicate pollution by hydrocarbons of lower molecular weight or chlorinated hydrocarbons. (Holoman-Battelle)
W73-13257

RESIDUE DETERMINATION OF ETHYLENETHIOUREA (2- -IMIDAZOLIDINETHIONE) FROM TOMATO FOLIAGE, SOIL, AND WATER,
Agricultural Research Center, Immokalee, Fla.
C. H. Blazquez.
Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 330-332, May/June 1973. 3 tab, 18 ref.

Descriptors: *Pesticide residues, *Soil contamination, Water pollution, *Foliar, *Bioassay, *Pollutant identification, Chemical analysis, Tomatoes, Plant tissues, Urea pesticides, Water analysis, Soil analysis, Separation techniques, Carbamate pesticides, Thiocarbamate pesticides, Metal organic pesticides, Ditches.
Identifiers: *Ethylenethiourea, Detection limits, Thin layer chromatography, Maneb, Zineb, Dithane M-45, Sample preparation, Sensitivity, 2-Imidazolidinethione, Ethylenethiuram monosulfide, Ethylenediamine, Solvent extraction systems, Alternaria solani, Dithane Z-78, Dithane M-22.

A thin-layer chromatographic method was developed for the analysis of ethylenethiourea (ETU) (2-imidazolidinethione) from tomato foliage, soil, and water. High yields of ETU were obtained when heat was applied during the evaporation of dioxane-water suspensions of the fungicides ethylenethiuram monosulfide (ETM) and ethylenebisdithiocarbamate (Dithane M-45). Investigations indicate that no ETU was detected from Dithane M-45 applications on tomato foliage, soil surface, or ditch water. The tlc method had a sensitivity of 1 ppm, which is adequate in residue analysis experiments. ETU was detected as low as 1 ppm with the tlc method, a concentration adequate in field investigations of the degradation of ethylenebisdithiocarbamate fungicide residues and their biological activity. The tlc method coupled with a bioassay technique fit well into residue monitoring (RM) method of the EWDC system for more efficient timing of pesticide applications. (Holoman-Battelle)
W73-13259

ATOMIC FLUORESCENCE SPECTROMETRY WITH A GRAPHITE ROD ATOMIZER AND THERMOSTATED ELECTRODELESS DISCHARGE LAMPS,
Florida Univ., Gainesville. Dept. of Chemistry.
B. M. Patel, R. D. Reeves, R. F. Browner, C. J. Molnar, and J. D. Winefordner.
Applied Spectroscopy, Vol 27, No 3, p 171-176, May/June 1973. 3 fig, 4 tab, 35 ref.

Descriptors: *Heavy metals, *Aqueous solutions, Cadmium, Copper, Mercury, Lead, Zinc, Chemical analysis, Methodology.
Identifiers: *Atomic fluorescence spectroscopy, *Multielemental analysis, *Graphite rod atomizer, *Electrodeless discharge lamps, *Oil-based solutions, Detection limits, Tin, Thallium, Organometallics.

Atomic fluorescence investigations with a graphite rod atomizer and thermostated multiple element electrodeless discharge lamps (EDL's) are reported for Ag, Cd, Cu, Hg, Pb, Sn, Tl, and Zn. Detection limits in the range 0.1 ng to 0.01 pg have been obtained for these elements using a sample volume of 0.5 microliter. The detection limits are better than, or close to, the lowest reported values obtained by other workers using atomic spectrometric methods. No spectral or chemical interferences have been observed when using multiple element EDL's or standard multielement solutions. The atomic fluorescence signal obtained using argon and argon-hydrogen atomospheres has been studied as a function of the gas flow rates and as a function of height above the graphite rod atomizer. Except for Hg, better fluorescence signals are obtained with argon-hydrogen. (Holoman-Battelle)
W73-13260

THE DETERMINATION OF ALL DETECTABLE ELEMENTS IN THE AQUATIC PLANTS OF LINSLEY POND AND CEDAR LAKE (NORTH BRADFORD, CONNECTICUT) BY X-RAY EMISSION AND OPTICAL EMISSION SPECTROSCOPY,
Pittsburgh Univ., Pa. Dept. of Biology.
U. M. Cowgill.
Applied Spectroscopy, Vol 17, No 1, p 5-9, January/February 1973. 7 tab, 7 ref.

Descriptors: *Aquatic plants, *Plant tissues, *Methodology, Chemical analysis, Littoral, Leaves, Root systems, Floating plants, Rooted

aquatic plants, Heavy metals, Alkali metals, Alkaline earth metals, Halogens, Pondweeds, *Connecticut, Beryllium, Mercury, Cobalt, Boron, Sodium, Molybdenum, Cadmium, Sampling, Potassium, Manganese, Calcium, Aluminum, Chlorine, Sulfur, Magnesium, Phosphorus, Iron, Titanium, Zinc, Copper, Strontium, Nickel, Cesium, Chromium, Lead, Iodine, Bromine, Fluorine, Submerged plants, Pollutant identification.
Identifiers: *X-ray emission spectroscopy, *Optical emission spectroscopy, *Chemical composition, Macrophtes, Rare earth elements, Linsley Pond, Clear Lake, Sample preparation, Stems, Blossoms, Hornworts, Bismuth, Tin, Vanadium, Silver, Lithium, Silicon, Nymphaea odorata, Scented pond lily, Nuphar advena, Yellow water lily, Ceratophyllum demersum, Potamogenton praelongus, Pontedaria cordata, Pickerelweeds, Decodon verticillatum, Swamp loosestrife, Scandium, Cerium, Lanthanum, Yttrium, Arsenic, Praseodymium, Neodymium, Gadolinium, Dysprosium, Erbium, Ytterbium, Thorium, Niobium, Samarium, Germanium, Barium, Hafnium, Zirconium.

A method, employing optical and x-ray emission, is described for the determination of all detectable elements in aquatic plants growing in the littoral zone of two lakes in Connecticut. The pondweed and the hornwort accumulate As. Comparative data are presented for the determination of this element by atomic absorption and x-ray emission. The chemical composition of some plants is shown as well as the distribution of the rare earths in various portions of the yellow water lily. (Holoman-Battelle)
W73-13261

COLIFORMS, FECAL COLIFORMS, AND FECAL STREPTOCOCCI AS INDICATORS OF WATER POLLUTION,
Hadassah Medical School, Jerusalem (Israel).
For primary bibliographic entry see Field 05B.
W73-13262

GAS-LIQUID CHROMATOGRAPHIC SEPARATION OF SULFUR FROM CHLORINATED PESTICIDE RESIDUES IN WASTEWATER SAMPLES,
Los Angeles County Sanitation Districts, Whittier, Calif.
R. B. Baird, L. G. Carmona, and C. L. Kuo.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 108-115, February 1973. 4 fig, 8 ref.

Descriptors: *Water analysis, Waste water (Pollution), *Sediments, *Sulfur compounds, *Separation techniques, *Chlorinated hydrocarbon pesticides, DDT, DDD, Endrin, Dieldrin, DDE, Aldrin, Heptachlor, Sulfur, Insecticides, Pesticide residues.
Identifiers: Chemical interference, *Gas liquid chromatography, *Column packing, Heptachlor epoxide, Lindane, BHC, Columns, Column cleanup, p p'DDT, p p'DDD, o p'DDT, o p'DDD, p p'DDE, o p'DDE.

Sulfur interference in the GC analysis of chlorinated pesticides was eliminated by the addition of 1.0 percent DC-200 to the column packing of 4.4 percent OV-17 and 4.7 percent QF-1 on 80/100 mesh Gas-Chrom Q solid support. Samples of 13 chlorinated pesticides were analyzed with the column. The effect of the DC-200 addition was to shift the major interfering sulfur peak between those of o,p'-DDE and p'p'-DDE, thus eliminating the sulfur interference with the analysis of these compounds without diminishing the resolution of the remaining pesticides of interest. Routine use of this mixed column demonstrated that satisfactory analysis of sulfur-containing wastewaters and sediments may be performed without lengthy chemical desulfurization or extraction of large quantities of sample followed by detection with a highly selective detector. (Little-Battelle)
W73-13263

DISTRIBUTION AND BACKGROUND LEVELS OF MERCURY IN SEDIMENT CORES FROM SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-13264

ENZYME ELECTRODES,
Utah Univ., Salt Lake City. Coll. of Engineering.
D. A. Gough, and J. D. Andrade.
Science , Vol 180, No 4084, p 380-384, April 27, 1973. 34 ref.

*Monitoring, *Methodology, *Pollutant identification, Chemical reactions, Properties, Electrochemistry, Enzymes, Amino acids, Ureas, Laboratory equipment, Research equipment, Reviews, Polarographic analysis, Pollutants, Organic compounds.
Identifiers: *Metabolites, *Potentiometry, *Immobilized enzyme electrodes, *Electrochemical behavior, Glucose, Response time, Enzyme electrodes, Enzyme immobilization, pH electrodes, pCO2 electrodes, pO2 electrodes, Oxidases, Urease, beta-Glucosidase, Catalase.

The development of biochemical-specific electrode system is discussed; some of the foreseeable problems that might be associated with their use are presented; and the essential literature is reviewed. It was determined that the clinical determinations of certain metabolites and soluble enzymes by means of enzyme electrodes are quite feasible. Such devices may be made highly specific by the use of appropriate enzymes and a high degree of accuracy can be obtained. Instantaneous and continuous determinations can be made from physiological fluids, and undesirable physiologic responses can theoretically be minimized, thus making long-term clinical monitoring a possibility. Enzyme electrodes may also have a useful lifetime and meet other practical requirements. (Holoman-Battelle)
W73-13266

KINETIC MICRODETERMINATION OF MERCURY IN NATURAL WATERS AND BIOLOGICAL MATERIALS,
Windsor Univ. (Ontario). Dept. of Chemistry.
P. J. Ke, and R. J. Thibert.
Mikrochimica Acta, No 3, p 417-427, 1973. 2 fig, 4 tab, 39 ref.

Descriptors: *Mercury, *Methodology, Chemical analysis, *Water analysis, Heavy metals, Urine, Chemical reactions, Chelation, Freshwater, Sea water, Rivers, Lakes.
Identifiers: *Biological samples, *Trace levels, Ion exchange resins, Detection limits, Blood serum, Errors, Organomercury compounds, Organometallics, Body fluids, Natural waters, Sample preparation.

A wet digestion has been developed to prepare water and biological samples for a kinetic determination of mercury using an iodide-catalyzed reaction between cerium (IV) and arsenite (III). A mercury-free control, prepared using ion-exchange with a selective chelating resin, was used by adding mercury standards to make a calibration curve. Both inorganic and organic mercury can be determined by the method described either in water or biological samples containing mercury in the range of 0.05 to 2.0 micrograms per ml. The procedure can be used satisfactorily down to the 0.005-ppm level for fresh water and urine with an overall error of less than 5 percent. The method can also be employed for the determination of mercury in sea water or blood serum with an error of 10 percent or less and gives results which compare favorably with other procedures. (Holoman-Battelle)
W73-13271

CHLORINATED HYDROCARBONS IN PLANKTON FROM THE GULF OF MEXICO AND NORTHERN CARIBBEAN,
Texas A and M Univ., College Station. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-13273

DISTORTION OF MIREX RESIDUES IN INSECTS OWING TO USE OF ISOPROPYL ALCOHOL AS A COLLECTION SOLVENT,
Agricultural Research Service, Gainesville, Fla. Insects Affecting Man and Animals Research Lab.
D. A. Carlson, W. A. Banks, and D. P. Wojcik.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 6, p 365-369, June 1973. 3 tab, 3 ref.

Descriptors: *Pesticide residues, *Pollutant identification, *Insects, Chlorinated hydrocarbon pesticides, Chemical analysis, Storage, Insecticides, Solvent extractions, Separation techniques.
Identifiers: *Mirex, *Isopropyl alcohol, Sample preservation, *Sample preparation, Organic solvents, Solenopsis invicta, Blattella germanica, Electron capture gas chromatography.

Collection or storage of insects in 70 percent isopropyl alcohol (IPA) was found to cause loss of body weight, major loss of nonpolar insecticides from submerged specimens, and transfer of insecticide to previously uncontaminated specimens. These effects may by no means be limited to mirex, since any chlorinated hydrocarbon is relatively lipophilic and may behave similarly. Residues reported for treated insects that have been collected or stored in alcohol may have been reduced to 12 percent of the original value. Moreover, small untreated vertebrates and invertebrates trapped in alcohol with insecticide-laden insects are likely to absorb significant amounts of insecticide from the solution. (Holoman-Battelle)
W73-13274

ATOMIC ABSORPTION SPECTROMETRY OF TRACES OF TRI- AND HEXAVALENT CHROMIUM,
Nagoya Univ. (Japan). Dept. of Synthetic Chemistry.
M. Yanagisawa, M. Suzuki, and T. Takeuchi.
Mikrochimica Acta, No 3, p 475-480, 1973. 3 fig, 1 tab, 1 ref.

Descriptors: *Pollutant identification, *Chemical analysis, Methodology, *Aqueous solutions, *Chromium, Hydrogen ion concentration, Solvent extractions, Chelation, Heavy metals, Pollutants, Cations.
Identifiers: *Trace levels, *Atomic absorption spectrophotometry, Metal chelates, Reproducibility, Sodium diethyldithiocarbamate, 8-Hydroxyquinoline, Thenoyltrifluoracetone.

Atomic absorption spectrometry combined with extraction has been shown to be a rapid and precise method (reproducibility of plus or minus 1 to approximately 2 percent for 5 determinations) for the determination of traces of tri- and hexavalent chromium. The chromium diethyldithiocarbamate chelate was used for chromium (VI), whereas hydroxyquinolate or thenoyltrifluoracetonate chelate for chromium (III). A series of solutions in the range of pH 2 to approximately 8 was prepared and investigated to confirm the optimum pH range for extraction of chromium chelates. The optimum pH range for quantitative extraction of chromium chelates is 5 to approximately 7. Two extractions were necessary for complete extraction of the chromium hydroxyquinolate. Acetate buffer was suitable for the extraction of the chromium chelate, in contrast to poor extraction results in a phosphate buffer. Fe, Cu, Al, V, and Mo did not interfere with Cr absorption. The optimum flame conditions were: flow rate of air, 6 l/min; flow rate of acetylene, 2 l/min; beam height, 10 mm above burner top. (Holoman-Battelle)

'73-13275

PPLICATION OF A SULFATE-SENSITIVE LECTRODE TO NATURAL WATERS,
exas Instruments, Inc., Dallas.
Jasinski, and I. Trachtenberg.
nalytical Chemistry, Vol 45, No 7, p 1277-1279, ne 1973. 3 tab, 6 ref.

escriptors: *Sulfates, *Sea water, *Waste water ollution), *Brackish water, Potassium, lorides, Magnesium, Volumetric analysis, Elec-odes, Water analysis, Calcium.
entifiers: *Ion selective electrodes, *Chemical eference, Chalcogenide glass electrode.

on-doped chalcogenide glass electrodes were ed to investigate potential interferences during alysis of sulfate ions in natural waters of high lfate content. The method was based on barium lfate precipitation. Test solutions were prepared which Ca, K, and Mg were added as interfering ns. Samples of waste water, brackish water, and a water were also analyzed. A Ag/AgCl elec-ode was used as reference in the analyses. The sulting difficulties introduced by the ions con-idered were essentially the same as in all barium lfate methods. Sodium ion and chloride ion at a ndredfold excess caused no problems. Potassi-n ion interfered at this concentration level via precipitation; 94 percent recovery was obtained r 0.02 m sulfate ion in 0.1 M KCl. Magnesium d calcium distort the end point because of simul-aeous complexation with sulfate ion; this does t cause a major problem with the titration chnique. Although calcium also coprecipitates, s effect is sufficiently reproducible to allow for rrection if the Ca content is known. At high lfate concentrations the sample can be diluted to nimize interference. (Little-Battelle)
73-13276

ON SPECTRAL INTERFERENCE IN THE TERMINATION OF ZINC BY ATOMIC AB-RPTION SPECTROMETRY,
izona State Univ., Tempe. Center for Meteorite udies.
R. Kelly, and C. B. Moore.
alytical Chemistry, Vol 45, No 7, p 1274-1275, ne 1973. 1 fig, 2 tab, 12 ref.

scriptors: *Zinc, *Aqueous solutions, Iron, avy metals.
entifiers: *Chemical interference, *Atomic ab-rption spectrophotometry, Errors, Accuracy.

ueous solutions were prepared for atomic ab-rption spectrometry by dissolving iron spong in Cl, drying, and dissolving in distilled water. ese solutions were used to demonstrate that n solutions, completely free of zinc, absorbed he zinc resonance line. Iron was extracted from mples of the solution for analysis of zinc. Ab-rption curves showed that the determination of v levels taken to remove iron from the samples or to analysis. Solutions which contain between to 2.0 percent iron will be erroneously high by and 13 micrograms/g Zn, respectively. It is sug-ted that existing analyses of zinc on ferrous terials should be approached with caution. (Lit-Battelle)
73-13277

IELOMETRIC TITRATIONS OF METAL CA-ONS USING THE TUNGSTEN BRONZE ECTRODE,
es Lab., Iowa.
A. Wechter, P. B. Hahn, G. M. Ebert, P. R. ntoya, and A. F. Voigt.
alytical Chemistry, Vol 45, No 7, p 1267-1269, ne 1973. 3 fig, 1 tab, 6 ref.

scriptors: *Volumetric analysis, Aluminum, c, Copper, Iron, Calcium, Magnesium, Heavy tals, Aqueous solutions, Electrodes, *Alkaline th metals, *Metals, *Cations.
Identifiers: *Tungsten bronze electrodes, *Ion selective electrodes, Sample preparation, Chemical interference.

Tungsten bronze electrodes were used with saturated calomel electrodes in the potentiometric titration of solutions of Al (III), Zn (II), Cu (II), Fe (III), Ca (II), and Mg (II). Solutions were prepared by dissolving Al, Zn, and Cu in HN03 and diluting and by dissolving salts of the remaining elements. Solutions were buffered with NH3/NH4C1 or NH4N03 and titrated with EDTA. There was excellent agreement between calculated and observed values. Oxygen in the solutions did not interfere in the titrations. In order to perform a successful metal ion titration, only one of the following criteria need be met: the metal ion be titrable in basic solution either directly or indirectly, the ion be easily reducible directly at the electrode surface, or a metal redox couple be present which undergoes a change in concentration ratio at the end point. (Little-Battelle)
W73-13278

DETERMINATION OF TRACES OF THALLIUM IN URINE BY ANODIC STRIPPING AC VOLTAMMETRY,
Universidad Nacional de Rosario (Argentina). Faculty of Biochemical Sciences.
D. I. Levit.
Analytical Chemistry, Vol 45, No 7, p 1291-1292, June 1973. 1 fig, 1 tab, 10 ref.

Descriptors: *Urine, Lead, Dissolved oxygen.
Identifiers: *Thallium, *Chemical interference, *Anodic stripping voltammetry, Sample preparation, Albumin, Reproducibility.

The purpose was to apply the ac anodic stripping voltammetry technique with the hanging mercury drop electrode (HMDE) in a body fluid urine in order to determine, rapidly and directly, traces of thallium by measuring the current peak which results from the fundamental hermonic as stripping voltammogram record. The behavior of thallium was examined, and the presence of interferences such as lead, dissolved oxygen, organic compounds, and other complications that effect the electrode process by adsorption were minimized under the selected conditions of experimentation. The sensitivity of the method was improved by a low background current and was reproducible within 2.5 percent for 0.05 ppm thallium in urine. The Tl (I) wave had a symmetrical shape, and its ac peak was a linear function of the concentration in the micromolar range without interference from overlapping waves. Pre-treatment by dilution, cell exchange, use of complexing agents, degasification, and foaming were not required. (Little-Battelle)
W73-13279

DETERMINATION OF NITROGEN-15 BY CHEMICAL IONIZATION MASS SPECTROMETRY,
Rockefeller Univ., New York.
C. V. Lundeen, A. S. Viscomi, and F. H. Field.
Analytical Chemistry, Vol 45, No 7, p 1288-1290, June 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Mass spectrometry, *Nitrogen, Digestion, Radioisotopes, Ammonia.
Identifiers: *Sample preparation, *N-15, Biological samples, N-14, Acid digestion, *Chemical ionization mass spectrometry.

A technique is presented for determining N-15 using isobutane chemical ionization mass spectrometry. The method is based on the fact that ammonia is easily protonated by the tert-butyl ion in isobutane chemical ionization mass spectrometry to produce the NH4 (plus) ion, but water is not protonated to produce the H30 (plus) ion. Consequently, the relative amounts of N-15 and N-14 in ammonia containing both of these isotopes are obtained from the intensities of the m/e 18 and 19 ions produced where ammonia is introduced into the mass spectrometer. The ammonia to be measured is produced from the original nitrogenous material by acid digestion and is absorbed on solid stearic acid. The stearic acid is placed in the solids introduction probe and heated to release the ammonia. (Little-Battelle)
W73-13280

CHROMATOGRAPHY OF 48 METAL IONS ON STANNIC ARSENATE AND PLAIN PAPERS IN BUTANOL-NITRIC ACID MEDIA,
Z. H. Coll. of Engineering and Technology, Aligarh (India).
M. Qureshi, and S. D. Sharma.
Analytical Chemistry, Vol 45, No 7, p 1283-1288, June 1973. 5 fig, 5 tab, 10 ref.

Descriptors: *Metals, *Separation techniques, *Ion exchange, Lead, Potassium, Copper, Calcium, Zinc, Manganese, Cobalt, Nickel, Mercury, Cadmium, Beryllium, Magnesium, Iron, Aluminum, Chromium, Ceium, Gold, Titanium, Molybdenum, Ions, Strontium.
Identifiers: *Paper chromatography, Silver, Rubidium, Cerium, Palladium, Barium, Samarium, Praseodymium, Neodymium, Indium, Gallium, Lanthanum, Yttrium, Bismuth, Antimony, Ruthenium, Iridium, Thorium, Hafnium, Columbium, Tungsten, Platinum, Thallium, Organic solvents, Uranyl, Vanadyl.

The chromatography of 48 metal ions was systematically studied in butanol-HNO3 systems on plain and ion exchange papers. Solutions were prepared of K, Rb, Cs, Cu, Ca, Pd, Zn, Mn, Co, Ni, Hg, Cd, Ba, Sr, Be, Mg, Pb, Uo2, Fe (II), VO, Sm, Pr, Nd, Fe (III), In, Ga, La, Y, Al, Cr, Ce (III), Bi, Sb, Au, Ru, Ir, Th, Hf, Ti, Ce (IV), Cb, Mo, W, Pt, Ag, and Tl and spotted on the papers. Separations are given on the basis of R sub F values. In addition, the Ksub sp of the arsenates of K, Rb, Cs, Tl, Y, La, Ga, and Ce were predicted on the basis of the R sub F values. (Little-Battelle)
W73-13281

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUES OF METHYLCARBAMATE INSECTICIDES IN CROPS AS THEIR 2,4--DINITROPHENYL ETHER DERIVATIVES,
Agricultural Research Service, Beltsville, Md.
E. R. Holden.
Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 713-717, May 1973. 5 fig, 3 tab, 3 ref.

Descriptors: *Separation techniques, *Gas chromatography, *Plant tissues, Pesticide residues, Crops, Carbamate pesticides, Asparagus, Carrots, Lettuce, Tomatoes.
Identifiers: *Sample preparation, *Detection limits, *Methylcarbamate pesticides, Aminocarb, Bay 32651, Bay 78537, Bux, Carbanolate, Carbaryl, Carbofuran, Ciba C-9643, Decarbofuran, Hercules 5727, Hercules 9007, Landrin, Mesurol, Mexacarbate, Mobam, Promecarb, Propoxur, Biological samples, Kale, Chromatograms, Cucumbers, Eggplant, Green beans, Spinach, Squash, Organic solvents, Recovery.

A general procedure was developed for determining methylcarbamates in plant materials. The pesticides investigated were Aminocarb, Bay 32651, Bay 78537, Bux, Carbanolate, Carbaryl, Carbofuran, Ciba Cl9643, Decarbofuran, Hercules 5727, Hercules 9007, Landrin, Mesurol, Mexacarbate, Mobam, Promecarb, and Propoxur. The residue was extracted from crop material with acetonitrile, and the extractive purified by partitioning with petroleum ether and coagulating with phosphoric acid-ammonium chloride solution. Phenolic impurities were largely eliminated by partitioning a methylene chloride extract with 0.1 N potassium hydroxide. Carbamate residues were then treated with 1-fluoro-2,4-dinitrobenzene to

form the ether derivative without a prior hydrolysis step. Efficiency in the conversion of the phenolic moieties to the phenyl ethers was essentially 100 percent, thus providing for good reproducibility. Residues were determined at levels as low as 0.05 ppm. Recoveries generally ranged between 90 and 110 percent. (Little-Battelle)
W73-13282

COLLABORATIVE STUDY OF THE NONAQUEOUS COPPER COLORIMETRIC AND SILVER TITRIMETRIC METHODS FOR THE DETERMINATION OF MALATHION IN TECHNICAL GRADE MALATHION AND IN MALATHION FORMULATION,
American Cyanamid Co., Princeton, N.J.
R. S. Wayne.
Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 579-585, May 1973. 4 fig, 7 tab, 8 ref.

Descriptors: *Methodology, *Chemical analysis, Reliability, Volumetric analysis, Gas chromatography, Testing procedures, Evaluation.
Identifiers: *Collaborative studies, *Method evaluation, *Comparative tests, Standard methods, Coefficient of variation, Interlaboratory tests, *Malathion, Gas liquid chromatography, Copper colorimetry, Silver titrimetry.

The nonaqueous copper colorimetric and the silver titrimetric methods for the determination of malathion were studied collaboratively. The study involved wettable powders, emulsifiable concentrates, dusts, and the technical grade product. The mean of all of the results indicates that both procedures will give comparable values for each sample type used in the study. Agreement between replicates in individual laboratories was excellent. Agreement between laboratories was satisfactory; coefficients of variation ranged from 1.3 to 4.8 percent for the sample studied. The 2 methods offer improved reliability and ease of operation when compared to the official first action colorimetric method, 6.265-6.269. The methods have been adopted as official first action. (Mortland-Battelle)
W73-13283

AN ISOLATION AND CLEANUP PROCEDURE FOR LOW LEVELS OF ORGANOCHLORINE PESTICIDE RESIDUES IN FATS AND OILS,
Food and Drug Administration, Washington, D.C. Div. of Chemistry and Physics.
M. L. Porter, and J. A. Burke.
Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 733-738, May 1973. 3 fig, 3 tab, 9 ref.

Descriptors: *Oil, *Chlorinated hydrocarbon pesticides, *Lipids, *Polychlorinated biphenyls, DDE, DDD, DDT, Dieldrin, Aroclors, Separation techniques, *Pesticide residues.
Identifiers: *Cleanup, Lindane, Mirex, Heptachlor epoxide, Endosulfan I, Endosulfan II, Endosulfan sulfate, Aroclor 1254, Vegetable oil, Fish oil, Animal oils, Recovery, Detection limits, Chromatograms.

An isolation and cleanup is described for low levels of organochlorine residues (about 0.005 ppm) in fats and oils, prior to electron capture gas-liquid chromatography, Corn oil, butterfat, cold liver oil, chicken fat, and several dietary composites were used in the analyses for lindane, DDE, TDE, DDT, Mirex, heptachlor epoxide, endosulfan I and II, dieldrin, endosulfan sulfate, and Aroclor 1254. The fat or oil was distributed on a column of unactivated Floriisil and the residues partitioned into an eluant of 10 percent water in acetonitrile. Florisil column chromatography with an elution solvent system comprised of mixtures of methylene choride, acetonitrile, and hexane was used for the final cleanup. Extracts prepared in this manner were sufficiently free of fatty extractives to permit injection of the equivalent of 50-60 mg fat sample for GLC. The procedure should be especially useful in determination of low levels of organochlorine pesticide residues in the fat of certain dietary composites. (Little-Battelle)
W73-13284

COMPARATIVE EXTRACTION OF CHLORINATED HYDROCARBON INSECTICIDES FROM SOILS 20 YEARS AFTER TREATMENT,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 05B.
W73-13285

MERCURY CONTAMINATION OF FISH IN NORTHWESTERN ONTARIO,
Acres (H. G.) and Co. Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 05C.
W73-13287

MICRO AND SEMIMICRO DETERMINATION OF THIOLS WITH ION-SELECTIVE ELECTRODES,
California Univ., Livermore. Lawrence Livermore Lab.
W. Selig.
Mikrochimica Acta, No 3, p 453-466, 1973. 3 fig, 4 tab, 21 ref.

Descriptors: *Sulfur compounds, *Pollutant identification, *Methodology, Electrochemistry, Chemical analysis, Volumetric analysis, Organic compounds, Solubility, Solvents.
Identifiers: *Ion selective electrodes, *Trace levels, *Thiols, *Potentiometric titration, Reproducibility, Iodide electrodes, Sulfide electrodes, Chloride electrodes, Copper electrodes, Lead electrodes, Bromide electrodes, Mercuric perchlorate, Chemical recovery, *Mercaptans, Quinolinethiol, Toluenethiol, Thiosalicylic acid, Thiomallic acid, Dodecanethiol, Thionalide, Mercaptoacetic acid, Potassium salts, Glutathione, Sodium salt.

Described is the potentiometric determination of a variety of thiols. Microamounts (0.01 to 0.1 mM) are titrated with 0.01 N mercuric perchlorate while semimicroamounts (0.1 to 0.5 mM) are titrated with 0.05 N mercuric perchlorate. A bromide selective indicator electrode and a single-junction reference electrode are used with an expanded-scale pH meter to monitor the emf. Other indicator electrodes based on a silver sulfide matrix may also be used. The preferred solvent is acetone while ethanol and p-dioxane have limited applicability. The electrode response is slower in general than for other titrations using ion-selective electrodes, particularly for the more complex thiols and those attached to a heterocyclic ring system. (Holoman-Battelle)
W73-13289

CHEMICAL COMPOSITION OF OCEAN USING A DIRECT MEASURING OCEANOGRAPHIC ELECTROCHEMICAL PROBE,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 02K.
W73-13294

IN SITU ACTIVATION ANALYSIS OF MARINE SEDIMENTS WITH CALIFORNIUM-252,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 02K.
W73-13295

IMPROVED WATER ANALYSIS KIT,
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 07B.
W73-13297

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS.
Wisconsin Univ., Madison. Inst. of Environmental Studies.

Available from the National Technical Information Service as N73-13378, $3.00 in paper copy, $1.45 in microfiche. 1971-1972 Progress Report No NASA-CR-129797, 1972. 83 p, 31 fig, 13 tab, 7 ref. Contract No NGL-50-002-127.

Descriptors: *Remote sensing, *Water quality, *Monitoring, *Aquatic environments, *Research and development, *Water resources, Great Lakes, Pollutant identification, Laboratory tests, Model studies, On-site investigations, Methodology, Water pollution, Lake Superior, Lake Michigan, Mathematical models, Hydrologic properties, Powerplants, Aerial photography, Photogrammetry, Outlets, Eutrophication, Industrial wastes, Pulp wastes, Pulp and paper industry, Aquatic plants, Primary productivity, Ecosystems, Instrumentation.
Identifiers: Thermal scanning imagery, Lake Wingra, Myriophyllum spicatum, Macrophytes, Infrared radiometry, Oedogonium, Nuphar, Nymphaea, Lake Mendota, Data interpretation, Wisconsin River, Fox-Illinois River, Fox River, Galena River, Ceratophyllum demersum, Infrared thermal scannery.

Progress has been made in relation to five specific water resources problems to which remote sensing techniques have been applied in on-going research. The problem areas are: (1) water pollution monitoring, (2) effluent mixing zone modeling, (3) current and circulation modeling, (4) determination of hydrologically active source areas, and (5) analysis of aquatic ecosystems. Briefly stated, the programs in these areas have the following objectives: (1) To ascertain the extent to which special aerial photography can be used in monitoring water pollution parameters through a comparison of photo imagery and actual pollution conditions. (2) To develop a relationship between the extent of the 'mixing zone' in terms of outfall effluent, and water body characteristics by utilizing the imagery obtained from intensive aerial remote sensing and applying the derived data in duplicating the 'mixing zone' charcteristics in a series of laboratory model studies. (3) To determine the fine scale structure and efficiency of nearshore circulation patterns in the Great Lakes through the use of thermal scanning imagery and analytic photogrammetric techniques. (4) To develop a remote sensing technique for determining the location and extent of source areas in a watershed. (5) To use remote sensing in the development of a production model for Myriophyllum spicatum L. in Lake Wingra, and to evaluate the field potential of remote sensing techniques in detecting the occurrence, intensity, duration and composition of algal blooms in the Madison, Wisconsin, area lakes. The methods and data for each of the 5 areas are given. (Mortland-Battelle)
W73-13299

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (VI): APPENDICULARIANS OF THE CENTRAL ARCTIC, MYSIDS OF THE ARCTIC OCEAN AND CONFLUENT SEAS, FIELD GUIDE TO ARCTIC ZOOPLANKTONIC CRUSTACEANS OSTRACODS OF THE CENTRAL ARCTIC,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
Y-m. Leung.
Available from the National Technical Information Service as AD-756 660, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 2, October 1972. 48 p, 29 fig, 31 ref. Project No 307-270, Contract No N00014-67-A-0269-0013.

Descriptors: *Zooplankton, *Arctic Ocean, Crustaceans, Invertebrates, On-site data collections, Benthic fauna, Arctic, Amphipoda, Copepods, Isopods.
Identifiers: *Appendicularians, *Taxonomic guides, Macroinvertebrates, Mysids, Ostracods, Eunicates, Oikopleura spp, Fritillaria spp, Appendicularia, Kowlewskai, Euphausiids, Decapods, Parathyconchoecia, Boreomysis spp, Parerythrops spectabilis, Pseudomma frigidum, Michthyops keeli, Mysis spp, Conchoecia spp, Acetabulastoma arcticum.

Six practical taxonomic guides to zooplankton were prepared to the USC Arctic Project to meet the needs to non-taxonomists involved with Arctic fauna. Material presented in this guide is based upon results of research by investigators associated with this Project and its precursors since 1952. This compilation is composed of information on the five species of ostracods and five species of appendicularians found amongst central Arctic zooplankton; mysids from the central Arctic and peripheral seas; and a general guide to Arctic zooplanktonic crustaceans. Each guide contains dichotomous keys and complementary illustrations, special notes on individual species, and selected references to literature pertaining to the included groups. (Holoman-Battelle)
W73-13300

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS,
Washington State Univ., Pullman. Coll. of Engineering.
For primary bibliographic entry see Field 05B.
W73-13338

MARINE MICROBIOLOGY, FIVE-YEAR PROGRESS REPORT, 1967-1972,
Woods Hole Oceanographic Institution, Mass.
W. Watson.
Available from NTIS, Springfield, Va., as COO-3565-1; $4.00 in paper copy, $1.45 in microfiche. Report Coo-3565-1, 1972. 46 p, 32 fig, 47 ref. AEC-T (11-1)03565.

Descriptors: *Estuarine environment, *Marine bacteria, *Microbial degradation, *Nitrogen fixing bacteria, Cytological studies, Water pollutant identification, Biomass, Biochemistry, Biological properties, Nitrification, *Nitrates, *Nitrites, Urea, Organic compounds, Chemical reactions, Carbon radioisotopes, Analytical techniques.

The research program is summarized on microorganisms that oxidize ammonia to nitrite and nitrite to nitrate, including their fine-structure and biochemical properties, distribution, and the rates of the in-situ reactions. Degradation rates of urea, acetate, and glucose in estuarine and offshore waters were measured using labelled compounds. A test being developed that is specific for bacterial biomass in the presence of the biomass of other organisms also has potential applications in water pollution studies, determination of bacteria in sediment, and detection of contamination of radioisotope solutions intended for injection into patients. In this test, a lysate from the blood of the horseshoe crab is used to detect free bacterial lipopolysaccharides (also known as pyrogens or endotoxins). (Bopp-ORNL)
W73-13339

DETERMINATION OF AG, HG, AND ARSENIC IN SEAWATER.
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.
For primary bibliographic entry see Field 05B.
W73-13346

METHODOLOGY FOR THE IDENTIFICATION OF A BIOLOGICAL INDICATOR IN RADIOECOLOGY: EXAMPLE OF CS137 AND A FRESHWATER MOLLUSC ANODONTA, (METHODOLOGIE POUR LA RECHERCHE D'UN INDICATEUR BIOLOGIQUE EN RADIOECOLOGIE),
L. Foulquier, and A. Lambrechts.
Available from NTIS, Springfield, Va., as CEA-R-4373; $7.60 in paper copy, $1.45 in microfiche. Report CEA-R-4373, Sept 1972. 295 p, 71 fig, 65 tab, 118 ref.

Descriptors: *Bioindicators, *Nuclear wastes, *Radioisotopes, *Absorption, Public health, Path of pollutants, Radioecology, Water pollution effects, Monitoring, Molluscs, Estuarine environment, Phytoplankton, Temperature, Sediments, Food chains, Computer programs, Computer models, Potassium compounds.
Identifiers: Cesium radioisotopes.

A concentration factor of about 300 was found for a bivalve under conditions favoring uptake from food (chronic contamination of the water in the presence of phytoplankton, light, and silt). Also the uptake from food and sediment and effects of potassium, sediment agitation, temperature, and bivalve age were determined. A computer program modelled the simultaneous effects of three variables. In bivalves removed from contaminated water 38% of the total radioactivity was on the shell, 20% in the viscera, 22% in the other soft parts and 13% in internal fluid. After 81 days decontamination in uncontaminated water the loss of radioactivity by the shell was 52%; by the soft parts, 25%; and by the internal liquid, 50%. Long-term biological half-times are given for various components of the bivalve (66-90 days for the entire bivalve, 32-45 days for the shell, and 72-90 days for the soft parts), and also for the individual organs. The results are compared with those by other authors. (Bopp-ORNL)
W73-13407

EIGHTEENTH ANNUAL CONFERENCE ON BIOASSAY, ENVIRONMENTAL AND ANALYTICAL CHEMISTRY, OCT. 10-11, 1972, PROGRAM AND ABSTRACTS.
Argonne National Lab., Ill.

Available from NTIS, Springfield, Va., as ANL-8014; $4.00 in paper copy, $1.45 in microfiche. Report ANL-8014, 1972. 39 p.

Descriptors: *Analytical techniques, Conferences, Radiosotopes, *Nuclear wastes, *Bioassay, Food chains, Aquatic environment, Estuarine environment, Benthic fauna, Tritium, Fallout, Soil analysis, Water analysis, Pollutant identification, Milk, *Path of pollutants, Instrumentation, Radioactivity, Public health, *Radiochemical analysis, Radioecology.
Identifiers: Plutonium, Environmental impact statements.

Fourteen abstracts (of 25) concern analysis of radionuclides in humans or animals; ten abstracts concern analysis of water, soil, or freshwater and marine benthic organisms; and one abstract concerns the preparation of environmental impact statements. The ratio of the tritium specific activity in the organic or residue fraction to that in free water was 5-10 for soil and 1-1.2 for milk. Accumulations of radionuclides from nuclear powerplant discharges were located using a submersible NaI (Tl) probe. In environmental samples, reactor-produced and atmospheric-fallout Pu were distinguished by alpha spectrometric determination of the Pu240/Pu239 ratio. However, for detection of Pu-Am in large soil samples (to 1 kg), a technique using low-energy X radiation was advantageous. (Bopp-ORNL)
W73-13415

ACTIVATION ANALYSIS OF TRACE ELEMENTS IN BIOLOGICAL MATERIALS, (ANALYSE PAR ACTIVATION DE MECROQUANTITES D'ELEMENTS DANS LES MATERIAUX BIOLOGIQUE),
A. A. Kist, Ch. Khatomov, N. A. Krygenkova, S. S. Crestova, and R. Ya. Tuchkova.
Available from NTIS, Springfield, Va., as CONF-721069-44, $4.00 in paper copy, $1.45 in microfiche. Report CONF-721069-44, Oct 1972. 11 p, 3 fig, 2 tab.

Descriptors: *Pollutant identification, *Neutron activation analysis, *Water analysis, *Gold, *Gold radioisotopes, *Trace elements, Pesticide residues, Chlorides, Vegetation, Absorption, Soil types, Soil-water-plant relationships, Biology, Root zone, Sampling, Geochemistry, Soil chemistry, Biochemistry, Metabolism, Analytical techniques, Separation techniques, Solvent extraction.

Developments in neutron-activation analysis have improved precision and increased sensitivity. Comparison with microanalytical techniques requiring ashing showed ashing losses of 5-70% with K, Na, Mn, Fe, Sc, Zn, Cu, S, and P. In biogeochemical studies the sensitivity for determination of Au in natural waters and in plants was about 1 ppb. Plant uptake was also studied for Sb, As, Sc, and Mn. Gold in natural water samples was absorbed on activated carbon to avoid loss from deposition on container walls. Pesticide residues were analyzed by chloride determination after inorganic chlorides has been eliminated by extraction techniques using chloride-free solvents. Eye tissue was analyzed for 15 elements; the concentration of iodide in the eye envelope was about 100 times that in blood and in most other human tissue. (Bopp-ORNL)
W73-13420

OCCURRENCE OF SE75 AND SN113 IN OYSTERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
B. Patel, and A. K. Ganguly.
Health Physics, Vol 24, p 559-562. 1973. 1 fig, 2 tab, 13 ref.

Descriptors: *Radioisotopes, *Bioindicators, *Nuclear wastes, *Pollutant identification, Water pollution sources, Monitoring, Radioecology, Mollusks, Gastropods, *Oysters, Effluents, Nuclear powerplants, Analytical techniques, Radioactivity techniques, Marine animals, Estuarine environment, Absorption.
Identifiers: Tin radioisotopes, Selenium radioisotopes.

The specificity of various species of molluscs in the vicinity of the Tarapur nuclear powerplant for various radionuclides suggested their use as biological monitors. Gastropods (aplysia benedicti, Cellana radiata, and Onchidium verruculatum) concentrated Co radioisotopes; oysters (Crassostea cucullata and Crassostea gryphoides) concentrated Sn113 and Se75, which were identified by the energy of gamma spectrum lines and half lives; but not Co. The Sn113 probably results from neutron activation of Sn112 (isotopic abundance 0.95%) in fuel cladding and structural alloys; the Se75, from neutron activation of Se74 of unknown origin or as a fission product. Concentrations that have been reported in marine organisms are: Sn, 0.2-20 ppm; Se, 0.5-8.6 ppm. (Bopp-ORNL)
W73-13424

AUTOMATED WATER MONITORING INSTRUMENT FOR PHOSPHORUS CONTENTS,
Nuclear Corp. of America, Denville, N.J. Nuclear Div.
M. J. Prager.
Copy available from GPO Sup Doc as EP1.23/5:73-026, $0.50; microfiche from NTIS as PB-222 772, $1.45. Environmental Protection Agency, Monitoring Series Report EPA-R4-73-

026, June 1973. 26 p, 6 fig, 2 ref. EPA Project 16020 GSB. 68-01-0111.

Descriptors: *Monitoring, *Phosphorus, Analytical techniques, *Flame photometry, *Pollutant identification, Automation, *Instrumentation, Measurement.

A prototype instrument was developed for automatically monitoring total phosphorus in water. The analytical principle employed was flame emission photometry. Phosphorus compounds burned in a hydrogen flame emit at about 525 millimicrons. Conditions were established for the sensitive measurement of phosphorus in water. Operating parameters investigated included fuel and air flow rates burner configuration, operating temperature, method of sample aerosolization, etc. Using an ultrasonic nebulizer to aerosolize samples of triethylphosphate in water, it was possible to detect phosphorus at a concentration of less than 2 parts per billion. A procedure was worked out for distinguishing between organic and inorganic phosphorus with ion exchange resins. In measurements designed to determine interference by sodium and calcium, it was observed that the method is about 1000 times more sensitive towards phosphorus than towards sodium and 5000 times more sensitive towards phosphorus than towards calcium. A prototype instrument was designed, fabricated and tested. (EPA)
W73-13470

A SIMPLE TECHNIQUE FOR ISOLATION OF PELODERA CHITWOODI, A BACTERIOPHAGOUS NEMATODE, FROM SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Plant Pathology.
M. M. Joshi, and G. R. Wilt.
Proceedings of the Helminthological Society of Washington, Vol 40, No 1, p 167-168. January 1973. OWRR A-0160ALA (4).

Descriptors: *Nematodes, *Bacteria, *Bacteriophage, *Isolation, Analytical techniques, Pollutant identification.
Identifiers: *Pelodera, Agarbacterium, Vibrio.

A technique is described which employs bacteria for the isolation of Pelodera chitwoodi from soil. Ten grams of mud infested with eight species of nematodes were placed in the center of an agared petri dish which had been innoculated with two drops of bacterial suspension 2-3 cm from the center. After three to four hours incubation, an examination showed that ninety-nine percent of the nematodes accumulated around the bacterial colonies were the bacteriophagous Pelodera chitwoodi. Several repeated experiments gave the same results. (Owen-Alabama)
W73-13501

SOND CRUISE 1965: FACTOR AND CLUSTER ANALYSES OF THE PLANKTON RESULTS, A GENERAL SUMMARY,
National Inst. of Oceanography, Wormley (England).
M. V. Angel, and M. J. R. Fasham.
Journal of the Marine Biological Association of the United Kingdom, Vol 53, No 1, p 185-231, February 1973. 14 fig, 15 tab, 46 ref.

Descriptors: *Distribution patterns, *Copepods, *Biological communities, *Amphipoda, Mathematical studies, Zooplankton, Invertebrates, Sampling, Marine animals.
Identifiers: *Data interpretation, *Ostracods, *Euphausiids, *Chaetognaths, Factor analysis, Cluster analysis, Canary Islands, Macroinvertebrates.

The data for five planktonic taxa sampled during the SOND cruise (autumn 1965) by R. R. S. 'Discovery' in a day and a night series of horizontally towed nets have been analyzed by factor and cluster analyses. The factor analyses of hauls showed that there were five biologically distinct zones in the water column between the surface and 1000 m. The zones were more distinct in the day series than in the night. Factor analyses of the individual taxa gave sensible groupings of species and the factor score plots gave 'averaged' depth distributions for each group. Cluster analyses of the individual taxa gave results consistent with the factor analyses. Both methods gave groupings which fitted the zonation patterns of the hauls, except for the two zones between 100 and 460 m at night. Only cluster analyses could be carried out on the total data matrices. Although satisfactory interpretation was only possible with the aid of the analyses of the individual taxa, the zonation and species groupings were again largely retained. The zonation of the planktonic taxa is very similar to that described for nektonic species sampled on the same cruise. The usefulness of these analytical methods is compared with the conclusions of other investigators. It is concluded that the rotation of the matrices to simple structure in the factor analysis gave a marked improvement in the ease of interpretation. For the data, principal component analyses gave very similar results to the full factor analyses. (Little-Battelle)
W73-13507

ENERGY FLOW IN A WOODLAND STREAM ECOSYSTEM: II. THE TAXONOMIC COMPOSITION AND PHENOLOGY OF THE CHIRONOMIDAE AS DETERMINED BY THE COLLECTION OF PUPAL EXUVIAE,
Pittsburgh Univ., Pa. Pymatuning Lab. of Ecology.
For primary bibliographic entry see Field 05C.
W73-13509

IDENTIFICATION BY MEANS OF RETENTION PARAMETERS,
Max-Planck-Institut fur Kohlenforschung, Muelheim an der Ruhr (West Germany).
G. Schomburg, and G. Dielmann.
Journal of Chromatographic Science, Vol 11, No 3, p 151-159, March 1973. 7 tab, 33 ref.

Descriptors: *Gas chromatography, *Organic compounds, Pollutant identification.
Identifiers: *Kovats indices, *Retention time, *Retention volume, Hexane, Benzene, Methylpentanes, Hexenes, Cyclohexanes, Chlorohexanes, Hexanals, Hexanones, Hexanols, Cyclohexanones, Octenes, Methylnonane, Hexylcyclopropanes, Undecanes, Standardization, Reproducibility.

Retention parameters, preferably Kovats indices, can be used to identify chromatographically separated components of mixtures, and in addition, chemical derivatives thereof. For reliable correlations of peaks, combined use of other mainly spectroscopic identification methods is necessary. There are two different methods of applying Kovats indices which are table matching and/or incremental predictions of I and delta I values. Identification by table matching is demonstrated with saturated and unsaturated hydrocarbons from C5 to C6 of a gasoline cut and C6 compounds. Identification by retention increments is demonstrated with 1-ocetene, 2-methylnonane, 3-methylnonane, hexyl-cyclopropane, methyl-branched undecanes, and unsaturated and methyl-branched cyclopropanes. The extended use of retention parameters are limited until recently because of a lack in data reproducibility due to column polarity and apparatus parameters. Proposals are made as to how these difficulties may be overcome and as to the corrections and standardizations which may be made in order to obtain precise data. (Little-Battelle)
W73-13511

THE SIGNIFICANCE OF HYDROCARBON ASSIMILATION IN YEAST IDENTIFICATION,
Technische Hogeschool, Delft (Netherlands). Lab of Microbiology.
P. Bos, and J. C. de Bruyn.
Antonie van Leeuwenkoek, Vol 39, No 1, p 99-107, 1973. 4 tab, 35 ref.

Descriptors: *Yeasts, *Pollutant identification, *Systematics, Organic compounds, Classification, Aquatic fungi, Pathogenic fungi, Marine fungi
Identifiers: *Assimilation, *Hydrocarbons, Substrate utilization, Octane, Decane, Hexadecane, Alkanes, Nutrient sources, Candida spp, Ascomycetes, Basidiomycetes, Fungi imperfecti, Culture media, Ambrosiozyma cicatricosa, Debaryomyces nepalensis, Hansenula spp, Pichia spartinae spp, Saccharomyces cordubensis, Saccharomyces gaditensis, Bullera dendrophila, Sporobolomyces antarcticus, Brettanomyces, Torulopsis spp, Trichosporon spp, Selenotila spp, Debaryomyces spp, Metschnikowia spp, Lipomyces spp, Schwanniomyces spp, Sporidiobolus spp, Sporobolomyces spp, Selenotila spp, Hansenula spp, Saccharomyces spp, Kluyveromyces spp, Trichosporon aquatile, Trichosporon cutaneum var. antarcticum.

A large number of yeasts were screened for the ability to assimilate hydrocarbons. Not only representatives of the genus Candida, but also species from other perfect and imperfect genera are able to use n-alkanes as sole carbon and energy source. The significance of this feature in yeast systematics is discussed. In general, all strains of a species share either the ability to assimilate hydrocarbons or the failure to do so. Exceptions are found in species regarded as heterogeneous, like Candida sake, Candida diddensii and Candida zeylanoides. In cases where the usual criteria used in identification seem to be inadequate, the simple hydrocarbon assimilation test may be useful. Also in subgrouping the genera Candida and Torulopsis the test may be of value, because some perfect genera like Hansenula, Kluyveromyces and Saccharomyces lack hydrocarbon-assimilating representatives. (Holoman-Battelle)
W73-13512

DIFFERENTIATION OF MYCOBACTERIUM TUBERCULOSIS FROM OTHER MYCOBACTERIA BY SUSCEPTIBILITY TO ETHYL AND METHYL ESTERS OF P-NITROBENZOIC ACID,
Chubu Chest Hospital, Obu (Japan).
For primary bibliographic entry see Field 05C.
W73-13513

MERCURY RESIDUES IN FISH, 1969-1970 - NATIONAL PESTICIDE MONITORING PROGRAM,
Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research.
C. Henderson, A. Inglis, and W. L. Johnson.
Pesticides Monitoring Journal, Vol 6, No 3, p 144-159, December 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Mercury, *Freshwater fish, *Marine fish, Heavy metals, Sampling, Rivers, United States, Lakes, Hudson River, Connecticut River, Potomac River, Colorado River, Mississippi River, Rio Grande River, St. Lawrence River, Lake Ontario, Lake Erie, Lake Huron, Lake Michigan, Lake Superior, Ohio River, Missouri River, Columbia River.
Identifiers: *Biological samples, *Sample preparation, *Atomic absorption spectrophotometry, Methylmercury.

As part of the fish monitoring program conducted by the Bureau of Sport Fisheries and Wildlife since 1967, composite fish samples collected during the fall of 1969 and 1970 were analyzed for mercury. Fish were collected using seives, gill nets, traps, hook and line, and electrofishing.

Three composite samples, each of a different species and consisting of 3-5 adult fish, were collected at each of 50 monitoring stations in 1969; similarly, three composite samples and in most cases a replicate sample of one of the species were collected at each of 100 stations in 1970. Stations were located on major rivers and lakes throughout the United States. Samples were wrapped in foil, frozen, and shipped to a laboratory for analysis by atomic absorption. Each composite was thawed, cut in small pieces, homogenized in a food chopper, digested, and analyzed by the cold vapor technique. Total mercury residues equal to or exceeding the sensitivity level of 0.05 ppm were found in 129 of the 145 samples in 1969 and 373 of the 393 samples in 1970. Values ranged from less than 0.05 to 1.25 ppm in 1969 samples and from less than 0.05 to 1.80 ppm in 1970 samples. Analyses by two different laboratories of 40 selected samples from the 1970 collection gave comparable results. Analyses of 24 selected 1970 samples indicated that 90 percent or more of the mercury in fish was in the form of methyl mercury. (Little-Battelle)
W73-13514

ESTIMATING WATER QUALITY FROM ELECTRICAL LOGS,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-13556

FRESHWATER DIATOMS IN THAILAND,
N. Foged.
Nova Hedwigia, Vol 22, Nos 1-2, p 267-370, 1971. 106 ref.

Descriptors: *Diatoms, *Chrysophyta, *Aquatic algae, Aquatic plants, Systematics.
Identifiers: *Thailand, Achnanthes spp.

In freshwater material collected in 1966 in the central and northern part of Thailand about 378 diatom taxa are found, among which there are 8 new species, 5 new varieties and 2 new forms. All the diatoms found are listed and drawings and photographs from the researched material are given. (Holoman-Battelle)
W73-13570

ANALYTICAL APPLICATIONS OF POLYAMINE-POLYUREA CHELATING RESINS,
Massachusetts Univ., Amherst.
J. F. Dingman, Jr.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich. 48106 Order No. 73-5534. PhD Dissertation, 1972. 150 p.

Descriptors: *Aqueous solutions, *Separation techniques, *Heavy metals, *Resins, Analytical techniques, *Chelation, Chemical reactions, Water analysis, Cation exchange, Cadmium, Cobalt, Copper, Manganese, Nickel, Zinc, Selectivity, Pollutant itdentification, Cations.
Identifiers: Preconcentration, *Ion exchange resins, *Polyamine resins, *Polyurea resins, Chelating, Resin synthesis, Trace levels, Metal complexes, Sample preparation, Polythiourea resins, Polydithiocarbamic acid resins, Atomic absorption spectrophotometry, Silver, Detection limits, Natural waters, Column chromatography.

Analytical applications were investigated of a family of weak base, polyamine ion exchange resins with regard to their ability to form transition metal ion complexes from aqueous solutions. The resins are selective for those metals which readily form amine complexes, and hence alkali and alkaline earth elements are not adsorbed. This is desirable in the separation, concentration, and measurement of ultra-trace heavy metal cations from natural waters which are abundant in the Groups IA and IIA elements. The program consisted of three phases: the resin synthesis, the study of the metal-amine complex formation on the resin, and the study of the ability of the polyamine resins to selectively sequester trace heavy metal cations from aqueous solutions for preconcentration purposes. Toluene diisocyanate was used to polymerize and cross-link monomeric soluble polyamines from the polyethyleneimine family. Resins from ethylenediamine, triethylenetetraamine, tetraethylenepentamine, and polyethyleneimine monomers having average molecular weights of 1200 and 1800 have been synthesized. A number of resin synthesis methods were developed. Methods were developed to coat effectively these resins on solid supports. Adsorption isotherms of some heavy metal cations on the resins were established through batch equilibration procedures. The ability of the polyamine resins to sequester trace metal ions and then release the metals upon acidification was assessed by passing known, dilute concentrations of the desired metals through the resin, eluting with hydrochloric acid, then determining the percentage recovery of the metal ions. With a concentration factor of X1000, the successful analysis of these metals was achieved at the low concentration of 0.2 ppb. Other chelating ion exchange resins were synthesized for use as substrates in the metal sequestration study. (Holoman-Battelle)
W73-13571

WATER: EXAMINATION, ASSESSMENT, CONDITIONING, CHEMISTRY, BACTERIOLOGY, BIOLOGY,
K. Holl.
Water de Gruyter, New York, New York. 1972. 389p.

Descriptors: *Waste water (Pollution), *Water analysis, *Methodology, *Potable water, *On-site investigations, *Laboratory tests, *Pollutant identification, Biological properties, Water chemistry, Water properties, Chemical analysis, Water quality, Indicators, Water pollution, Water sampling, Swimming pools, Mineral water, Surface waters, Aquatic microbiology, Domestic wastes, Industrial wastes, Eutrophication.
Identifiers: Sample preservation, Potassium permanganate consumption, Ammonium ions, Medicinal water, Agars, Culture media, Aluminum sulfate, Counting, Brewery wastes, Carcinogens, Biochemical tests, Mineral oil, Core samplers, Cyanides, Radioactive decontamination, Dithizone methods, Enterococci, Ferric chloride, Hydrogen peroxide, Hydrazines, Klebsiella spp, Membrane filters, Most probable number test, Proteus spp, Pollutant removal, Settleability, Staphylococci, Streptococci, Suspended matter, Sterilization, Urine, Hellige method, Nitron method, Ion selective electrodes.

This book is concerned with the investigation and quality assessment of primarily drinking water. Due to the interrelationship of potable water with other types of water, including wastewater, those topics are also treated. Areas of interest that are covered include (1) general on-site investigations and laboratory tests, (2) chemical examination methods, (3) pollution indicators, (4) tap water analysis, (5) examination and assessment of swimming bath water, surface waters, and wastewater, (6) the bacteriology of drinking water, and (7) the biology of water. (Holoman-Battelle)
W73-13573

RESULTS OF DRINKING WATER TESTING IN THE SZCZECIN PROVINCE AREA UNDERTAKEN AS PROPHYLACTIC MEASURE AGAINST ALIMENTARY POISONING OF INFANTS, (IN POLISH),
H. Pilawaka, and D. Torum.
Rocz Panstw Zakl Hig. Vol 22, No 6, p 665-671. 1971. Illus. English summary.
Identifiers: *Alimentary poisoning, *Infant diseases, Measure, Poisoning, *Poland (Szczecin), Prophylactic, Testing, *Potable water.

CHEMICAL TESTING OF DRINKING WATER WAS CONDUCTED ROUTINELY FOR 4 YR IN 122 RANDOMLY CHOSEN RURAL WELLS LOCATED ON INDIVIDUAL FARMS IN THE Szczecin Province area of Poland. The tests included nitrate level determinations. In 78% of the cases, the amount of nitrates exceeded the 10 mg NNO3/1 level considered permissible in drinking water for infants. A proposal is made to introduce compulsory testing of the well water on those farms where the family is expecting offspring.--Copyright 1973, Biological Abstracts, Inc.
W73-13581

COLORIMETRIC ASSAY FOR CARBOXYMETHYLOXYSUCCINATE, A NEW DETERGENT BUILDER,
Lever Bros. Co., Edgewater, N.J. Research Center.
J. P. Viccaro, and E. L. Ambye.
Journal of the American Oil Chemists' Society, Vol 50, No 6, p 213-217, June 1973. 5 fig, 6 tab, 30 ref.

Descriptors: *Assay, *Detergents, *Methodology, *Water analysis, *Pollutant identification, *Spectrophotometry, *Waste identification, Colorimetry, Sewage effluents, Color reactions, Chemical reactions, Waste water (Pollution), Chemical analysis, Organic compounds, Organic acids, Sewage treatment, Pollutants.
Identifiers: Trisodium carboxymethyloxysuccinate, Chemical interference, Sample preparation, Sensitivity, Accuracy, Quantitative analysis, Detection limits, *Carboxymethyloxysuccinate, Dextrose, Glycolic acid, Acetaldehyde, Butyraldehyde, Formaldehyde, Propionaldehyde, Benzoic acid, Citric acid, Fumaric acid, Gluconic acid, Lactic acid, Malic acid, Oxalic acid, Oxaloacetic acid, Succinic acid, Tartaric acid, Beta-naphthol, Absorption spectra, Chemical recovery.

A spectrophotometric assay was developed for the quantitative determination of carboxymethyloxysuccinate (CMOS), a new detergent builder. The method was based on the color produced with beta-naphthol in 92.5 percent (w/w) sulfuric acid. As little as 1.0 microgram of carboxymethyloxysuccinate can be measured. Pretreated and untreated samples from sewage effluents and river waters were prepared with solutions of CMOS ranging from 1 to 30 ppm. The samples were centrifuged, Millipore-filtered through a 0.22-micron membrane, and acidified with concentrated HCL to 1.0 N. Mililiter samples were placed into test tubes, evaporated to dryness and assayed according to the prescribed procedure. The CMOS recovery values were almost identical in both the sewage effluent and river water samples; the mean absolute recovery values (least squares slopes) were 97 and 96.4 percent, respectively. The recovery of similar amounts from the same samples, which were treated under the pretreatment procedure, was 94.5 percent for the primary sewage and 93.7 percent for river water. The results of an investigation to determine which compounds may interfere with detection of CMOS showed that under the prescribed assay conditions, glycolic, lactic, tartaric and dextrose equal in weight to CMOS, contributed only 1.2, 1.5, 4.7 and 1.5 percent errors, respectively. These small errors could be tolerated in most instances. Of particular significance was the lack of interference from the Krebs cycle intermediates, citric, fumaric, malic, oxaloacetic and succinic acids. Formaldehyde and acetaldehyde were also included in this experiment but displayed no absorbances, since both compounds were removed during the evaporation step. The addition of HCl and evaporation steps not only permitted the use of very dilute samples and an initial concentration of 92.5 percent for maximum sensitivity, but also provided additional specificity to the method by reducing interferences from glycolic and lactic acids, and dextrose. (Holoman-Battelle)
W73-13637

AN IMPROVED METHOD FOR THE ANALYSIS OF LINEAR ALKYLATE SULFONATE,
Calspan Corp., Buffalo, N.Y.
I.. K. Wang, J. Y. Yang, and M. H. Wang.
Preprint, presented at the 28th Annual Purdue Industrial Waste Conference, Purdue University, Lafayette Indiana. May 1973; 18 p, 1 fig, 2 tab, 4 ref.

Descriptors: *Surfactants, *Detergents, Aqueous solutions, Saline water, Sea water, *pollutant identification, Analytical techniques, Water analysis, *Linear alkylate sulfonates, Volumetric analysis.
Identifiers: Quarternary ammonium salt, Sodium tetraphenylboron, Two-phase titration, *Anionic surfactants.

The wide usage of linear alkylate sulfonate type detergents in both domestic and industrial applications together with the known toxicity of these pollutants has made the surveillance of anionic surfactant discharges in waste water effluents one of the most important water quality safeguard requirements. The needed routine analysis task is complicated by the acknowledged difficulty inherent in the determination of trace quantities of anionic detergents in saline water. The current accepted procedures are designed mainly to establish an upper limit of the surfactant content and their applicability is limited to water samples free of other major pollutants. The improved procedure developed in this study is suggested for a broader application to the analysis of anionic surfactants in polluted fresh or saline waters.
W73-13643

DETERMINATION OF MERCURY IN GEOLOGIC MATERIALS BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Geological Survey, Washington, D.C.
J. Marinenko, I. May, and J. I. Dinnin.
Geological Survey Prof. Paper 800B, p B151-B155, 1972. 3 fig, 2 tab, 13 ref. 23*Mercury, Geological investigations, *Analytical techniques, Sampling, Calibrations, Geology, Statistical methods, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy, Geological materials, Sample preparation, Combustion tubes, Errors.

A flameless atomic absorption method is described for determining submicrogram amounts of mercury. Powdered samples are heated with a calcium oxide-cupric oxide flux in a quartz combustion tube packed with lime and elemental copper. Evolved mercury vapor is swept through a packing of gilded silica where it is amalgamated. The amalgam is rapidly heated and the released mercury vapor is swept through an absorption cell and determined by atomic absorption spectrometry. Two nanograms of mercury absorb 1 percent of the incident signal. Tracer studies with Hg 203 indicated 97 percent recovery of mercury at submicrogram levels during the sintering and amalgamation step. The release of submicrogram levels of mercury from the gilded silica for its detection by atomic absorption is better than 99 percent complete. (Oleszkiewicz-Vanderbilt)
W73-13649

5B. Sources of Pollution

SULFUR BUDGET OF LAKE SHELBYVILLE, ILLINOIS, AND THE EFFECTS OF SULFIDES UPON CHAOBORUS,
Illinois Univ., Urbana. Water Resources Center.
W. U. Brigham, and S. R. Gnilka.
Available from the National Technical Information Service as PB-222 497, $3.50 in paper copy, $1.45 in microfiche. Research Report No 66, June 1973. 59 p, 5 fig, 7 tab, 30 ref. OWRR A-056-ILL (1). 14-31-0001-3813.

Descriptors: Limnology, *Sulfur, *Bacteria, Reservoirs, Bioassay, *Illinois, *Sulfur bacteria, Regression analysis, Water pollution sources, Water pollution effects.
Identifiers: *Chaoborus, *Lake Shelbyville (Ill).

The sources and annual cycle of sulfur were studied in the Lake Shelbyville Basin, Illinois, from 6 April 1972 through 28 March 1973. Three sources of sulfur were identified: rainfall, surface runoff, and pollution. Decomposition of inundated organic matter and solution of inorganic sulfur compounds from the inundated basin were considered one-time sources. Exchange between groundwater and the lake was considered to be in long-term equilibrium. Significant relationships between sulfate loading and discharge were detected. Regression analysis yielded an accurate means of calculating sulfate concentration from discharge measurements. Green sulfur bacteria were isolated from lake samples during the study year. During the previous summer stagnation period, purple sulfur bacteria were detected accompanying noticeable concentrations of hydrogen sulfide. Static bioassay studies of Chaoborus larvae yielded a minimum effect level for sulfide of 0.64 mg liter -1 (as S) for a 4-hour test. Pupae responded more rapidly to sulfide than did larvae. Relatively brief exposure to a low sulfide concentration was often sufficient to kill or immobilize a substantial percentage of the test organisms.
W73-13005

FACTORS CONTROLLING COPPER (II) CONCENTRATIONS IN THE KEWEENAW WATERWAY,
Michigan Technological Univ., Houghton. Dept. of Chemistry and Chemical Engineering.
D. G. Leddy.
Available from the National Technical Information Service as PB-222 463, $4.25 in paper copy, $1.45 in microfiche. Michigan State University, East Lansing, Project Completion Report, Institute of Water Research, July 1973. 105 p, 22 fig, 5 tab, 16 ref, 2 append. OWRR A-065-MICH (1). 14-31-0001-3822.

Descriptors: *Copper, *Mine wastes, Lake Superior, *Michigan, Copper compounds, Model studies, *Chemical reactions, Water chemistry, Lethal limit, Toxicity.
Identifiers: *Torch Lake (Mich), Keweenaw Waterway (Mich), Mine tailings.

The occurrence of copper (II) in the Keweenaw Waterway from past use of the waterway as a dumping basin for copper-bearing mine tailings is a matter of concern because of the toxic effects of copper (II) on aquatic organisms. From 1972 to the present soluble copper as well as several other cations and anions were monitored at varying depths in water exposed to mine tailings. According to water chemistry the Keweenaw Waterway may be divided into two areas: one consists of Torch Lake, and the other area is the remainder of the waterway, i.e., Portage Lake and the ship canal. The soluble copper (II) in the Portage Lake and ship canal section varies from 5 to 50 ppb and is controlled by the low copper concentration (8 ppb) water of Lake Superior which flushes this section of the waterway. The soluble copper (II) in Torch Lake seems to be controlled by a combination of chemical precipitation, dissolution, complex formation, and physical adsorption. Soluble copper in Torch Lake varies between 30 and 100 ppb. The model proposed as a description of soluble copper concentration control in Torch Lake predicts Cu++, CuCO3 (soluble), CuOH+, and Cu (organic) to be the principal copper species in solution. Cu (organic) is at times equal to 50 per cent of the total dissolved copper. Ionic copper (Cu++) is found at times to reach extremely toxic levels. The model does not predict the exact concentrations observed; it does predict the general trend.
W73-13010

INTERACTION BETWEEN MARINE ORGANISMS AND OIL POLLUTION,
Woods Hole Oceanographic Institution, Mass
For primary bibliographic entry see Field 05C
W73-13023

FINITE ELEMENT SOLUTION TO UNCONFINED GROUNDWATER FLOW WITH INFILTRATION,
Rhode Island Univ., Kingston. Dept. of Civil Engineering.
W-H Chen.
M Sc Thesis, 1971. 104 p, 16 fig, 42 ref. OWRR-A-036-RI (2)

Descriptors: *Groundwater movement, *Recharge, *Path of pollutants, *Finite element analysis, Numerical analysis, Computer programs, Infiltration, Seepage, Sewage disposal.

Saturated, steady-state, unconfined groundwater flow may be calculated with a computer program which is particularly suitable for flow through heterogeneous and anisotropic porous media with complex geometric boundaries. The program can handle problems with a vertical or nearly vertical free surface. Infiltration at the free surface can also be handled with ease. An example demonstrates the applicability of the computer program. The problem concerns a two-demensional flow from a sewage-disposal field to a water-supply source. The solution is in terms of the relation between the spacing of the sewage disposal field and the water-supply source and time, in conjunction with a field test for verification and modification, it should be helpful for sanitary engineers who wish to investigate the pollution of ground water sources. (Knapp-USGS)
W73-13031

AQUATIC ORGANISMS AND HEAVY METALS IN MISSOURI'S NEW LEAD BELT,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05C.
W73-13037

REGIME, THEORY, AND METHODS OF CALCULATION AND MEASUREMENT OF SEDIMENTS AND WASTE WATERS (REZHIM TEORIYA, METODY RASCHETA I IZMERENIYA NANOSOV I STOCHNYKH VOD).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-13045

AN IMPROVED QUICK-FIELD METHOD OF CALCULATING WASTE WATER DILUTION IN RIVERS (USOVERSHENSTVOVANIYE EKSPRESS-METODA RASCHETA RAZBAVLENIYA STOCHNYKH VOD V REKAKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
M. A. Bestsennaya.
In: Rezhim, teoriya, metody rascheta i izmereniy nanosov i stochnykh vod; Gosudarstvenny Gidrologicheskiy Institut Trudy, No 191, p 20-208, Leningrad, 1972. 2 fig, 2 tab, 4 ref.

Descriptors: *Analytical techniques, *Waste water (Pollution), *Waste dilution, *Self-purification, Rivers, Streams, Discharge (Water), Flow, Hydraulic properties, Dimensional analysis, Curves, Equations, Path of pollutants.
Identifiers: USSR.

A modified version of a quick-field method developed by the author for calculating waste water dilution in small rivers is described. Results are presented of a numerical experiment to improve and refine earlier relations, and new working formulas consider channel shape and resistance to flow. The modification proposed can also be used for approximate calculations of wa

water dilution in average-size and large rivers. (See also W73-13045) (Josefson-USGS)
W73-13054

CONTRIBUTIONS OF ALLOCHTHONOUS DETRITUS TO THE ENERGY REGIME OF DOE RUN, MEADE COUNTY, KENTUCKY,
Louisville Univ., Ky. Water Resources Lab.
C. R. Liston.
Research Report, May 1972. 104 p, 10 fig, 22 tab, 66 ref, append. OWRR A-032-KY (1).

Descriptors: *Nutrients, *Leaves, *Ecosystems, *Riparian plants, Organic matter, Food chains, Maple trees, Oak trees, Beech trees, Hickory trees, *Kentucky, Amphipoda, Degradation (Decomposition), Streams, Surface waters, Energy, Aquatic environment, Leaching, Biodegradation, Lipids, Proteins, Carbohydrates.
Identifiers: *Aquatic ecosystems, Beech trees.

Leaves from deciduous riparian trees provide an important source of energy and nutrients for aquatic ecosystems, especially in temperature climates. A study was undertaken in a spring-fed, woodland stream in north-central Kentucky to determine the kinds and amounts of leaves that entered the stream throughout the year, their calorific equivalents, and the protein, lipid, and carbohydrate contents of those leaves and the rates at which they were lost when submerged in the streams. Annual accumulation was 354 g/sq m/year for an estimated total of 17,700 kg. Calorific equivalents for 15 different kinds of leaves ranged from 3,789 cal/g dry weight for hickory to 4,417 cal/g for red oak. The upper 5 km of Doe Run received nearly 70 million kcal of energy from allochthonous leaf material from October 1, 1968, through September 30, 1969. The sugars and related substances leached rapidly into the streams, the lipid content leached slowly, and the protein content increased during an 8-week period. Amphipoda showed the following preference of leaves as food: hickory, red elm, sugar maple, beech, red oak, and sycamore. (Knapp-USGS)
W73-13056

INTERACTION OF YELLOW ORGANIC ACIDS WITH CALCIUM CARBONATE IN FRESHWATER,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
A. Otsuki, and R. G. Wetzel.
Limnology and Oceanography, Vol 18, No 3, p 490-493, May 1973. 2 fig, 1 tab, 18 ref. NSF GI-20 and GB-31018X, AEC AT (11-1)-1599, COO-1599-63.

Descriptors: *Organic matter, *Calcium carbonate, Lipids, Humic acids, Adsorption, Crystallization, Calcite.
Identifiers: Yellow organic acids.

Large amounts of soluble yellow organic humic acids are removed from lake water with precipitating $CaCO_3$ by adsorption and incorporation into crystals during nucleation. This mechanism may function as a scavenger of trace metals (especially iron) which are complexed with yellow acids in natural waters. Calcium carbonate particles selectively adsorb lipid material from natural waters. Yellow acids behave like lipid material with respect to association with $CaCO_3$ particles. Yellow acids can be reextracted by 0.1 M sodium acetate and 0.1 M sodium bicarbonate solutions from butanol, which also suggests that they have the characteristics of strong organic acids, rather than of phenolic compounds. (Knapp-USGS)
W73-13058

SIZE CLASSES OF ORGANIC CARBON IN SEAWATER,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
J. H. Sharp.
Limnology and Oceanography, Vol 18, No 3, p 441-447, May 1973. 2 fig, 3 tab, 34 ref.

Descriptors: *Colloids, *Organic matter, *Sea water, *Particle size, Carbon, Filters, Filtration.

Using carbon analyses, four size classes of organic matter in seawater were defined. An appreciable portion of the organic matter is smaller than the usually defined particulate class, but is probably not truly dissolved. This portion can be segregated using very fine membrane filters and by using membranes designed for forced dialysis. This subparticulate class should be considered as colloidal organic matter. (Knapp-USGS)
W73-13062

WATER POLLUTION: ENVIRONMENTAL IMPACTS AND MEANS OF CONTROL,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W73-13078

FLOW PROPERTIES OF SUBMERGED HEATED EFFLUENTS IN A WATERWAY,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
J. A. Campbell, and J. S. Schetz.
AIAA Journal, (American Institute of Aeronautics and Astronautics), Vol 11, No 2, p 223-230, Feb. 1973. OWRR-B-041-VA (3).

Descriptors: *Heated water, Injection, Flow characteristics, *Jets, *Thermal pollution, Path of pollutants.
Identifiers: *Heated effluents, Jet path.

An experimental and theoretical investigation has been undertaken to study the trajectory and growth of thermal effluents having a range of discharge velocities and temperatures. The discharge of an effluent into a waterway was mathematically modeled as a submerged jet injection process by using an integral method which accounts for natural fluid mechanisms such as turbulence, entrainment, buoyancy, and heat transfer. The analytical results are supported by experimental data and demonstrate the usefulness of the theory for estimating the location and size of the effluent with respect to the discharge point. The capability of predicting jet flow properties, as well as the jet path, was enhanced by obtaining the jet cross-sectional area during the solution of the conservation equations (a number of previous studies assume a specific growth for the area). Realistic estimates of temperature in the effluent were acquired by accounting for heat losses in the jet flow due to forced convection and to entrainment of freestream fluid into the jet.
W73-13084

NITRIFICATION AND DENITRIFICATION - A SELECTED BIBLIOGRAPHY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
R. C. Sims, and L. W. Little.
UNC Wastewater Research Center Report No 14, February 1971. 19 p, 170 ref. EPA Project 11010 DGA. 14-12-505.

Descriptors: *Bibliographies, *Water pollution sources, Water pollution effects, Water pollution control, *Nitrogen, Soils, Effluents, Sewage treatment, *Waste water treatment, *Nitrification, *Denitrification.

This report comprises a selected bibliography of 170 references on nitrification, and denitrification pertinent to the microbiological processes involved; transformations of nitrogen in water, wastewater, and soil; sources of nitrogen in water and wastewater; and methods for removing nitrogen from wastewater.
W73-13085

THE EFFECT OF GROUND WATER LEVEL ON WATER MOVEMENT IN PEAT: A STUDY USING TRITIATED WATER,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 04A.
W73-13093

FOSSIL PIGMENTS IN THE SURFACE SEDIMENTS OF A MEROMICTIC LAKE,
Minnesota Univ., Minneapolis. Dept. of Botany.
E. Gorham, and J. E. Sanger.
Limnol Oceanogr. Vol 17, No 4, p 618-622, 1972. Illus.
Identifiers: *Fossil pigments, Lakes, *Meromictic lakes, Sediments, *Wisconsin, *Lake sediments.

Pigment concentration and diversity were measured in surface sediments on a transect across a small, meromictic lake in northwest Wisconsin. Pigment concentrations increase several fold and diversity by a third from the shallowest to the deepest sediments. Monimolimnetic chlorophyll derivatives are about 3 X and carotenoids nearly 2 X the hypolimnetic maxima in holomictic, eutrophic Minnesota lakes. Lower pigment concentrations at the deepest point along the transect suggest slumping of littoral detritus.--Copyright 1973, Biological Abstracts, Inc.
W73-13099

LOSSES OF ATRAZINE IN RUNOFF WATER AND SOIL SEDIMENT,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
J. K. Hall, M. Pawlus, and E. R. Higgins.
J Environ Qual. Vol 1, No 2, p 172-176. 1972. Illus.
Identifiers: *Atrazine loss, Herbicides, Oats, Runoff, Sediment, Soil sediment, Toxicity, Zeamays, *Pennsylvania, *Corn.

Atrazine losses in runoff water and soil sediment were determined in 1967 and 1968 after 7 rates (0, 0.6, 1.1, 2.2, 4.5, 6.7 and 9.0 kg/ha) of atrazine were applied pre-emergent to corn (Zea mays L.) seeded on field plots of Hagerstown silty clay loam (14% slope). Average losses for all rates in 1967 in runoff water and soil sediment equaled 2.4% and 0.16% of the total applied, respectively. In 1967, at the recommended rate (2.2 kg/ha) for preemergence applications to Pennsylvania soils, composite losses were 2.5% of the applied or approximately 0.05 kg/ha. In 1968, 1 yr after atrazine application, the average loss over all rates for the combined substrates was 0.01%. Analyses of soil core samples taken from all plots in 1967 revealed that 1 mo. after atrazine application an average of 67.9% remained in the soil, and 3 mo. later recoveries had decreased to 21.4% of that applied. The following year atrazine remaining in the soil had decreased to 15.9% in April and to 5.4% in Sept. At the recommended rate of application, recoveries decreased from 39% of that applied to 9% for the same time period in 1967. In 1969, typical atrazine toxicity symptoms were found in oats growing on plots which had received 6.7 and 9.0 kg/ha of atrazine in 1967. Damage was confined to the uppermost parts of the slope.--Copyright 1973, Biological Abstracts, Inc.
W73-13102

SOME ECOLOGICAL RELATIONSHIPS OF THE INVERTEBRATE DRIFT IN PRATERS CREEK, PICKENS COUNTY, SOUTH CAROLINA,
Oklahoma Univ., Norman. Dept. of Zoology.
For primary bibliographic entry see Field 02I.
W73-13107

THE CONTROL OF PH AND TOTAL ALKALINITY OR TOTAL CARBONATE IN AQUATIC BIOASSAYS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 05C.

W73-13111

PHOSPHATE MOVEMENT FROM AN AGRICULTURAL WATERSHED DURING TWO RAINFALL PERIODS,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
H. M. Kunishi, A. W. Taylor, W. R. Heald, W. J. Gburek, and R. N. Weaver.
J Agric Food Chem. Vol 20, No 4, p 900-905. 1972. Illus.
Identifiers: *Phosphates, Rainfall, *Watersheds (Agricultural), *Path of pollutants.

The distribution of available phosphate between dissolved and adsorbed forms carried by stream water and sediments was measured at 2 sampling stations on a stream draining an agricultural watershed during high water flows. During an intense summer storm at the watershed the total available phosphate carried by the stream was 0.762 g/ha. In a less intense spring storm the loss was 0.028 g/ha. Changes in phosphate concentration during the storms were interpreted in terms of the adsorption isotherms of the sediments, which show that material derived from subsoils and stream banks has a large adsorption capacity. Concentrations of about 200 ppb (P) in water from fertile topsoil were reduced to less than 15 ppb as it moved downstream. Detailed prediction of phosphate concentrations in moving streams depends on adequate knowledge of the quantity, chemical characteristics, and origin of the sediment carried by the stream.--Copyright 1973, Biological Abstracts, Inc.
W73-13115

NITROGEN BALANCE IN SOIL COLUMNS INTERMITTENTLY FLOODED WITH SECONDARY SEWAGE EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance, and F. D. Whisler.
J Environ Qual. Vol 1, No 2, p 180-186. 1972. Illus.
Identifiers: Cation exchange, Dentrification, Effluents, Intermitt floodings, Microorganisms, *Nitrogen balance, Sewage effluent, *Soils, Waste renovation, Water reuse, *Soil columns.

Short, frequent cycles of flooding soil columns (2 days flooded and 5 days dry) with secondary sewage effluent caused no net removal of N but transformed almost all of the N to nitrate. The net N removal during longer cycles (9-23 days flooded and 5 days dry) was 30%, and half of the N remaining in the water was concentrated into a wave of high-nitrate water, which represented 10% of the total volume of reclaimed water and was collected immediately after the dry period. Water collected from the columns after the wave of high-nitrate water passed contained 67% less N than the incoming sewage water. Alternate flooding and drying periods were necessary for consistent N removal. The net N removal was probably due to a combination of several reactions dominated by denitrification. Cation exchange was important in holding NH4+ in the soil until it could be nitrified, thereby concentrating N into smaller volumes of high-nitrate water. Denitrification is the logical reaction to investigate for higher net N removal because the soil microorganisms nitrified most of the NH4+ and N can be removed from the system as an inert gas by dentrification.--Copyright 1973, Biological Abstracts, Inc.
W73-13116

STUDIES ON VIBRIO PARAHAEMOLYTICUS IN KOREAN COASTAL WATERS: I. THE DISTRIBUTION OF V. PARAHAEMOLYTICUS (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
W. J. Lee, W. K. Choe, and S. K. Chun.
Bull Korean Fish Soc. Vol 3, No 4, p 213-218. 1970. Illus. English summary.
Identifiers: Cephalopoda, Coasts, Crustacea, Distribution patterns, Fish food, *Korea coastal waters, Mud, Poisoning, Sea, Shellfish, *Vibrio-parahaemolyticus.

The distribution of V. parahaemolyticus was studied in fish, shellfish, mud, Crustacea, sea water and Cephalopoda to determine possible origins of food poisoning in Korea. Of 517 samples obtained from mud, sea water, fish, Crustacea and Cephalopoda, 56 contained V. parahaemolyticus. Six strains were from mud samples, 7 from 44 sea water samples, 28 from 241 fish samples, 1 from 50 crustacean samples and 2 from 34 cephalopod samples. Seven strains were isolated from 48 samples in the Mokpo area and 2 were from 46 samples in the Pohang area. The number of strains in the Mokpo area and the number in the Pohang area were the highest and lowest, respectively.--Copyright 1973, Biological Abstracts, Inc
W73-13118

YELLOWSTONE NATIONAL PARK, BASELINE WATER QUALITY SURVEY REPORT.
Environmental Protection Agency, Kansas City, Mo. Region VII; and Environmental Protection Agency, Denver, Colo. Region VIII.

EPA Report, 1972, 115 p, 32 tab, 7 fig, 22 ref.

Descriptors: *Water quality standards, Pollutant identification, *Mountain watersheds, Water pollution sources, Oligotrophy, Data collections, Sewage effluents, *National parks.
Identifiers: *Yellowstone National Park, Missouri River, Wyoming Yellowstone Lake.

Water quality data obtained from the May 1970 to September 1970 investigation of the surface waters of Yellowstone National Park are summarized and evaluated. A brief description of climatic conditions, streamflows and past water studies is presented along with recommendations for actions to preserve and enhance existing conditions. Special appendices present detailed discussions of mine drainage in Soda Butte Creek, sewage treatment facilities evaluations, pesticide and radiological results and a summary of ranges and means of chemical, and microbiological and biological data for park waters. (Keffer-EPA)
W73-13133

POLLUTION ABATEMENT PROGRAMS IN THE DELAWARE RIVER ESTUARY,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 05G.
W73-13164

THE GEOGRAPHIC DISTRIBUTION OF FRESHWATER HIRUDINOIDEA IN CANADA,
Calgary Univ. (Alberta). Dept. of Biology.
R. W. Davies.
Canadian Journal of Zoology, Vol 51, No 5, p 531-545, May 1973. 1 tab, 70 ref, 1 append.

Descriptors: *Systematics, Aquatic animals, *Canada, *Annelids, *Speciation, *Spatial distribution, Animal groupings, Invertebrates.
Identifiers: *Leeches, Macroinvertebrates, *Hirudinea, Cystobranchus verrilli, Illinobdella spp, Myzobdella moorei, Piscicola spp, Antinobdella spp, Batracobdella spp, Glossiphonia spp, Helobdella spp, Marvinmeyeria lucida, Placobdella spp, Theromyzon spp, Dina spp, Erpobdella spp, Moorebdella spp, Nephelopsis obscura, Bdellrogatis plumbeus, Hirudo medicinalis, Macrobdella decora, Mollibdella grandis, Percymoorensis spp.

The distribution for each species of freshwater leech (Hirudinoidea) is described and discussed on a province or territory basis. The hosts for those species recorded as temporary parasites are listed. One hundred and eight new species records are listed including 28 records new to the province or territory. Percymoorensis lateralis is recorded in Canada for the first time, and the first record of freshwater leeches in the Yukon is made. (Mortland Battelle)
W73-13170

HYDROCARBONS IN THE PELAGIC SARGASSUM COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
K. A. Burns, and J. M. Teal.
Deep-Sea Research and Oceanographic Abstracts, Vol 20, No 2, p 207-211, February 1973. 1 fig, 2 tab, 14 ref.

Descriptors: *Chemical analysis, *Plant tissues, *Biological communities, Water sampling, Gas chromatography, Marine algae, Marine fish, Crustaceans, Food chains, *Organic compounds, Solvent extractions, Oil pollution, Absorption, Phaeophta, Marine animals, Crabs, Epiphytology, Invertebrates, Food webs, Pollutant identification.
Identifiers: *Sargassum natans, *Animal tissues, Fingerprinting, Sample preparation, Petroleum hydrocarbons, Natural hydrocarbons, Pipefish, Biosynthesis, Stomach, n-Heptadecane, n-Pentadecane, Pentadecane, Heptadecane, n-Alkanes, Portunus sayi, Planes minuta, Histrio histrio, Syngnathus pelagicus, Canthidermis, Leander tenuiformis, Macroinvertebrates, Triggerfish, Pelagic animals.

Samples of pelagic Sargassum weed and associated macrofauna were collected by dip-netting from ships using precautions against shipboard contamination described by Grice et al (1972). Before extraction, the plants were shaken free of animals and washed with pentane to remove surface contamination without disrupting the cells. These washings were analyzed to determine hydrocarbons adsorbed on the plant surface. Pentane-washed animals were gutted for stomach analysis, cut into small pieces, soxhlet extracted with distilled methanol for 48 hr, and this lipid extract partitioned into acid-washed, sodium distilled pentane. The pentane extract was concentrated, dried, purified on a 1:1 (vol:vol) column of alumina over silica gel, eluted and chromatographed on a 3 percent Apiezon L on Chromasorb W AW-DM CS) column. All the organisms appeared contaminated with petroleum hydrocarbons. There was no relation between the amount of natural, recently biosynthesized hydrocarbons in an organism and the amount of petroleum contamination. Animals had a larger ratio of petroleum to natural compounds than the Sargassum. There was no relation between the hydrocarbon content and the animals supposed positions in the food chain. (Holoman-Battelle)
W73-13172

GEOTHERMAL MERCURY POLLUTION IN NEW ZEALAND,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Chemistry Div.
B. G. Weissberg, and M. G. R. Zobel.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 148-155, March 1973. 2 fig, 2 tab, 14 ref.

Descriptors: *Mercury, *Rainbow trout, *Brown trout, *Bottom sediments, Chemical analysis, Water pollution, Lake sediements, Fluvial sediments, Water pollution sources, Heavy metals.
Identifiers: *New Zealand, *Muscle, Reduction aeration technique, Flameless atomic absorption spectrophotometry, Sample preparation, Waikato River, Lake Rotorua, Lake Rotomahana, Lake Taupo, Lake Okareka, Lake Maraetai, Salmo trutta, Salmo gairdneri, Wet ashing, Animal tissues, Geothermal sources, Methylmercury.

In connection with the study of the magnitude and extent of natural mercury pollution arising from

geothermal sources in New Zealand, rainbow and brown trout and sediments from the Waikato River lakes and some of the Rotorua lakes were analyzed for total mercury. A modified, stannous chloride reduction-aeration flameless AA technique, after wet ashing with nitric and sulfuric acids was used in the analysis. Check analyses, specific for methylmercury, were performed by gas chromatography on half of the trout samples. The results indicate much higher concentrations of mercury in trout living in waters receiving considerable geothermal discharges (Upper Waikato River, Lake Rotorua, and Lake Rotomahana) than in trout living in similar waters receiving little or no geothermal discharges (Lake Taupo and Lake Okareka). The concentrations of mercury in trout within a given lake increased with increasing fish weight, consistent with observations by others, and no distinct differences in mercury concentrations were observed between rainbow and brown trout, or between male and female trout of the same species, apart from the weight factor. The concentrations of mercury in sediments showed no apparent variation with increasing depth (i.e. age) of sediments. (Holoman-Battelle)
W73-13175

EPOXIDATION AND FATE OF (C-14)ALDRIN IN INSECTICIDE-RESISTANT AND SUSCEPTIBLE POPULATIONS OF MOSQUITOFISH (GAMBUSIA AFFINIS),
Mississippi State Univ., State College. Dept. of Zoology.
M. R. Wells, J. L. Ludke, and J. D. Yarbrough.
Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 428-429, May/June 1973. 2 tab, 11 ref.

Descriptors: *Aldrin, *Animal metabolism, *Fish populations, *Bioassay, *Path of pollutants, Water pollution effects, Pesticide toxicity, Chlorinated hydrocarbon pesticides, Insecticides, Chemical analysis, Proteins, Killifishes, Laboratory tests.
Identifiers: *Mosquitofish, Gambusia affinis, Fate of pollutants, *Detoxification, Epoxidation, Thin layer chromotography, Animal tissues, Liver, Brain, Sample preparation, Cleanup, Resistance.

One susceptible and two resistant populations of mosquitofish (Gambusia affinis) were treated with (C-14)aldrin to determine differences in aldrin epoxidation between susceptible and resistant mosquitofish brains and livers. Three groups of nine fish from each population were tested in 5 ppb of (C-14)aldrin. The aldrin was shown by assay to contain 2.5 percent dieldrin. Three fish were removed from each group after 4-8 hr exposure, washed carefully, and tissue samples were extracted and homogenized. After protein determination, samples were extracted three times with hexane and twice for recovery of lipid-bound material in the brain with 3:1 chloroform-methanol. Thin-layer chromotography samples were prepared from the remaining aqueous portion of the samples and were counted using a scintillation spectrometer. Resistant mosquitofish converted aldrin to dieldrin and/or water-soluble material at a greater rate than susceptible mosquitofish. These data would tend to support rate of detoxification as a possible mechanism of resistance to aldrin in the mosquitofish. (Mortland-Battelle)
W73-13190

ISOTOPHIC TRACER TECHNIQUES FOR IDENTIFICATION OF SOURCES OF NITRATE POLLUTION,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
E. P. Edwards.
Journal of Environmental Quality, Vol 2, No 3, p 382-387, July-September 1973. 4 tab, 25 ref.

Descriptors: *Tracers, *Path of pollutants, *Nitrates, Nitrogen, Radioisotopes, Fertilizers, Pollutant identification.

The use of labeled fertilizers with N-15 contents substantially higher or lower than the natural abundance figure is the only valid approach to the measurement of fertilizer contribution to the NO3 appearing in tile drains under field condition. The natural N-15 abundance approach to the measurement of percentage contribution of applied fertilizers to nitrate production was not successful in well-replicated laboratory incubation experiments. Time of incubation may be eliminated as a variable by incubating the control and fertilized samples for the same time and under exactly the same conditions. (Knapp-USGS)
W73-13201

SALT PICKUP FROM AGRICULTURAL LANDS IN THE GRAND VALLEY OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerbee, and W. R. Walker.
Journal of Environmental Quality, Vol 2, No 3, p 377-382, July-September 1973. 7 fig, 3 tab, 7 ref.

Descriptors: *Water pollution sources, *Colorado River, *Salinity, *Path of pollutants, Return flow, Irrigation, *Colorado, Water pollution, Water quality, Salts.
Identifiers: *Grand Valley (Colo).

Introduction of seepage and deep percolation losses to saline soils and aquifers, and the eventual return of these flows to the river system with their large salt loads, make the Grand Valley in Colorado one of the more significant salinity sources in the Upper Colorado River basin. The principal components of both the water and salt flow systems were delineated, and water and salt budgets were generated on a monthly basis for the water years 1969-1971. About 51,039 metric tons of dissolved solids are being added from the small 1876 ha test area. This salt contribution of about 27.1 metric tons/ha is proportionate to the valley-wide pickup. From this analysis, it is concluded that salinity control alternatives must focus on reducing the flow of water in the groundwater system. Possible measures include conveyance channel linings and improved on-farm water management practices. (Knapp-USGS)
W73-13202

POLLUTION OF KARST AQUIFERS,
A. I. George.
Water Well Journal, Vol 27, No 8, p 28-32, August 1973. 4 photo, 7 ref.

Descriptors: *Karst, *Land subsidence, *Water pollution sources, *Urban runoff, Sinks, *Kentucky, Karst hydrology, Urbanization, Urban hydrology, Path of pollutants, *Aquifers.
Identifiers: *Bowling Green (Ky).

The city of Bowling Green, Kentucky is built entirely on top of the Sinkhole Plain, a karst area typified by few surface streams, total subsurface drainage through matter trunk cave passages, and a surface karst topography of sinkholes. With these conditions sinkholes collect urban runoff and transmit the polluted water vertically downward to lower trunk cave passages which are connected to surface springs of Barren River and Drakes Creek. Surface drainage characteristics are drastically altered by large shopping centers and commercial and industrial complexes with acres of pavement. The roofing-over of sections of the Sinkhole Plain rechannels sheet runoff so that only a fraction of the total number of sinkholes that previously received recharge still do so. This has put an abnormal strain on the whole hydrosystem. A higher base level is coupled with cave stream excavation of silt-filled passages that have not received active circulation since the Pleistocene glacial era. Because of this, roof-over actively promotes the development of catastrophic sinkholes. A 30-ft rise in the water level in the cave is common during high flow periods, and the cave can be expected to have an even higher flow and base level with continued roofing of the Sinkhole Plain. Cesspools, seepage pits, septic tanks, waste treatment plants, and ill-maintained municipal sewer lines are prime sources of viral-bacteriological and chemical contamination of water resources in a limestone terrain. (Knapp-USGS)
W73-13203

A LITERATURE SURVEY OF OCEAN POLLUTION,
Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering.
H. H. Shih.
Available from NTIS, Springfield, Va 22151 as AD-743 101 Price $5.45 printed copy; $1.45 microfiche. Report No 71-6, May 1971. 110 p, 18 fig, 9 tab, 386 ref. ONR Contract N00014-69-A-0432.

Descriptors: *Reviews, *Water pollution, *Oceans, *Sea water, Water pollution sources, Water pollution effects, Path of pollutants, Water pollution control.
Identifiers: *Ocean pollution.

A survey of past studies on the problems of ocean pollution also identifies research areas in which there are notable deficiencies in knowledge. Available literature was surveyed for all phases of ocean pollution. A general description is given of ocean pollution of the world today. The chief pollutants, their sources, their effects, and the control of various types of ocean pollution are discussed. (Knapp-USGS)
W73-13211

GLUCOSE FLUX AT THE SEDIMENT-WATER INTERFACE OF TORONTO HARBOUR, LAKE ONTARIO, WITH REFERENCE TO POLLUTION STRESS,
Toronto Univ. (Ontario). Dept. of Zoology.
L. W. Wood, and K. E. Chua.
Canadian Journal of Microbiology, Vol 19, No 4, p 413-420, April 1973. 2 fig, 3 tab, 31 ref.

Descriptors: *Cycling nutrients, *Sediment-water interfaces, *Lake Ontario, *Water pollution effects, *Aquatic microorganisms, Water analysis, Lake sediments, Carbohydrates, Chemical analysis, Biochemistry, Methodology, Bottom sediments, Cores, Organic matter, Stress, Absorption.
Identifiers: *Gucose, *Heterotrophy, *Nutrient flux, Fate of pollutants, Substrate concentration, Turnover time, Sugars, Substrate utilization, Catabolism.

Cycling of glucose at the sediment-water interface was determined through coupling measurement of natural substrate concentrations with heterotrophic uptake by the natural microbial communities in the sediment and in the water column. Freshly collected cores containing both a sample of the water column above the sediment-water interface as well as 20 cm of undisturbed benthic community were used for glucose analysis. The analysis for glucose followed the biochemical method of Hicks and Carey (1968). Determinations of heterotrophy in water were done by the methods of Wright and Hobbie (1966) as corrected for respiratory loss of C-1402 by Hobbie and Crawford (1969). Determinations of aerobic heterotrophy in sediment were essentially the same as those using water except that the added glucose (5-20 microliters) ranged from 27.5 to 102.5 micrograms/liter. The same general cycling pattern was found for both polluted and less polluted parts of Toronto Harbour, so that other labile organic species possibly have similar cycles. Velocity of uptake of glucose (flux) and turnover time showed no relationship to either substrate concentration or

total organic matter of the sediments. Activity in the water column could be supported to a major extent by sediment export of substrate by turbulent diffusion. Sediment activity must be supported by particulate sedimentation and hydrolysis of large organic molecules, which may be aided by the macrobenthic community. Pollution stress apparently alters the catabolism of the substrate. The observed substrate concentrations may reflect a minimum of residual concentration, below which the microbial community has difficulty in taking up the substrate. (Holoman-Battelle)
W73-13236

EVIDENCE FOR BUFFERING OF DISSOLVED SILICON IN FRESH WATERS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
A. M. C. Edwards, and P. S. Liss.
Nature, Vol 243, No 5406, p 341-342, June 1973. 18 ref.

Descriptors: Freshwater, *Temporal distribution, *Spatial distribution, *Variability, Chemical reactions, Dissolved solids, Laboratory tests, Soils, Soil water, Chemical analysis, Water analysis, Lakes, Rivers.
Identifiers: Dissolved silicon, *Silicon, *Buffers.

Documented studies are presented which illustrate the low temporal and spatial variability found for dissolved silicon levels in freshwater. Sorption reactions involving dissolved silicon and solid phases are posed as the more likely buffer mechanism responsible for controlling the concentration of dissolved silicon in rivers, lakes and soils. (Holoman-Battelle)
W73-13238

EFFECT OF DYES ON BACTERIAL GROWTH,
Pennsylvania State Univ., University Park. Dept. of Microbiology.
D. Y. C. Fung, and R. D. Miller.
Applied Microbiology, Vol 25, No 5, p 793-799, May 1973. 5 tab, 8 ref.

Descriptors: *Dyes, *Growth rates, *Analytical techniques, *Aerobic bacteria, *Pollutant identification, Bioindicators, Cultures, Separation techniques, Methodology, Water pollution effects, E. coli.
Identifiers: Pollutant effects, *Bacterial physiology, Gram-positive bacteria, Gram-negative bacteria, Culture media, Tryptic soy broth, Alcaligenes faecalis, Enterobacter spp, Proteus vulgaris, Pseudomonas aeruginosa, Salmonella spp, Shigella flexneri, Serratia marcescens, Bacillus spp, Gaffkya tetragena, Micrococcus rhodochrous, Sarcina lutea, Streptococcus spp.

A rapid screening procedure was used to test the effect of 42 different dyes on the growth of 30 bacteria on solid media. Stock solutions of each dye were incorporated into a tryptic soy agar at final dilutions of 1:1000, 1:10,000, and 1:100,000 before sterilization of the media at 121C for 15 minutes. A multipoint inoculation device was used to transfer broth culture of the test organisms onto the agar surface. The agar plates were inverted for incubation at 37C for 24 and 48 hr. They were observed under incandescent as well as ultraviolet light and growth was recorded as positive or negative after 24-and 48-hr periods. The results indicated that many readily available dyes might have potential application for selective isolation of specific bacterial groups as well as value in differentiating between closely related bacterial taxa. Separation of Enterobacter from Escherichia, Salmonella from Shigella, and Staphylococcus from Micrococcus by selected dyes was also evaluated. (Mortland-Battelle)
W73-13243

METABOLISM OF NITRILOTRIACETATE BY CELLS OF PSEUDOMONAS SPECIES,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
J. M. Tiedje, B. B. Mason, C. B. Warren, and E. J. Malec.
Applied Microbiology, Vol 25, No 5, p 811-818, May 1973. 4 fig, 4 tab, 25 ref.

Descriptors: *Nitrilotriacetic acid, *Psudomonas, *Pollutant identification, *Metabolism, *Microbial degradation, Soil bacteria, Surfactants, Aerobic bacteria, Detergents, Cytological studies, Chemical analysis, Gas chromatography, Biodegradation, Cultures, Ammonia, Volumetric analysis, Radioactivity techniques.
Identifiers: *Fate of pollutants, *Degradation products, Substrate utilization, Scintillation counting, Manometric studies, Culture media, Liquid scintillation, Batch cultures, Aspartate, Glycine, Aconitate, Iminodiacetate, Glyoxylate, Sarcosine, Acetates, N-methyliminodiacetate.

A Pseudomonas species was isolated from soil which could degrade nitrilotriacetate (NTA) to CO2, H20, NH3, and cellular constituents without the accumulation of significant quantities of intermediates either in the presence or absence of several inhibitors. After extensive gas chromatography analysis, small quantities of aspartate, glycine, and aconitate were the only detectable compounds to accumulate during NTA degradation, and these compounds were not excreted from the cells. Manometric studies indicated that iminodiacetate, glycine, and glyoxylate are possible intermediates, whereas N-methyliminodiacetate, sarcosine, and acetate are not. The data are consistent with an oxidative cleavage of the C-N bond of NTA as the initial degradation step. The finding that NTA is readily oxidized to inorganic products and that no intermediates accumulated under a variety of conditions indicates that environmental concern for hazardous intermediates in NTA degradation seems unwarranted. (Mortland-Battelle)
W73-13244

CADMIUM TOXICITY AND ACCUMULATION IN SOUTHERN NAIAD,
Oklahoma Univ. Health Sciences Center, Oklahoma City. Dept. of Environmental Health.
For primary bibliographic entry see Field 05C.
W73-13251

METHANOL METABOLISM IN PSEUDOMONAD C,
Hadassah Medical School, Jerusalem (Israel).
For primary bibliographic entry see Field 05C.
W73-13256

METABOLISM OF ENDOTHALL BY AQUATIC MICROORGANISMS,
Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
For primary bibliographic entry see Field 05C.
W73-13258

COLIFORMS, FECAL COLIFORMS, AND FECAL STREPTOCOCCI AS INDICATORS OF WATER POLLUTION,
Hadassah Medical School, Jerusalem (Israel).
J. Cohen, and H. I. Shuval.
Water, Air, and Soil Pollution, Vol 2, No 1, p 85-95, March 1973. 5 fig, 3 tab, 23 ref.

Descriptors: *Coliforms, *Bioindicators, *Viruses, *Water pollution, Sewage treatment, Treatment facilities, Potable water, Lakes, Rivers, Chlorination, Efficiencies, Enteric bacteria, Pathogenic bacteria, Springs, Water wells, Water sampling, Biological treatment.
Identifiers: *Fecal coliforms, *Fecal streptococci, *Fecal pollution, Pollutant removal, Survival, Lake Kinneret, Culturing techniques, Culture media.

The presence and survival of coliforms, fecal coliforms, and fecal streptococci were studied under various ecological conditions (sewage treatment plants, heavily polluted rivers, a lake and other drinking water sources) and their relative importance as pollution indicators, especially of viral pollution, was examined for each type of water system examined. Grab samples were taken with sterile containers, filtered, and the bacteria were cultured. Coliform bacteria were cultured on m-Endo media (Difco) and counted after 24 hr incubation at 35 C. Fecal coliforms were incubated on M-FC broth (Difco) for 24 hr in a water bath at 44.5 C. Fecal streptococci were incubated for 4 hr at 35 C followed by 44 hr at 44.5 C to eliminate the growth of atypical microcolonies. In all cases the fecal streptococci were generally more resistant to the natural water environment and to purification processes than the other indicator organisms and at points distant from the original source of pollution were often the only indicators of the fecal nature of the pollution. In two of the systems studied the survival of the fecal streptococci paralleled the survival of enteric viruses better than the coliforms. The fecal streptococci may thus in certain cases provide a better estimate of the probable virus content in lightly contaminated water than the other two indicators. (Holoman-Battelle)
W73-13262

DISTRIBUTION AND BACKGROUND LEVELS OF MERCURY IN SEDIMENT CORES FROM SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. K. Syers, I. K. Iskandar, and D. R. Keeney.
Water, Air, and Soil Pollution, Vol 2, No 1, p 105-118, March 1973. 5 fig, 2 tab, 36 ref.

Descriptors: *Mercury, *Cores, *Lake sediments, *Pollutant identification, Spatial distribution, *Wisconsin, Hydrogen ion concentration, Heavy metals, Soil analysis, Chemical analysis, Deep water, Shallow water, Hardness (Water), Bottom sediments, Aquatic soils, Dredging.
Identifiers: *Flameless atomic absorption spectrophotometry, *Vertical distribution, Sample preparation, Organic carbon, Lake Mendota, Lake Minocqua, Lake Monona, Lake Wanbesa, Lake Kegonsa, Lake Wingra, Lake Mary, Lake Crystal, Lake Snake.

The vertical distribution of Hg in sediment cores from a range of hard-and soft-water lakes in Wisconsin was evaluated in terms of potential sources of Hg during the nineteenth and twentieth centuries. Core samples were collected in the winter of 1970-1971 from deep-water areas from each lake and two cores were also taken from shallow water areas in Mendota and Minocqua. Cores were sectioned at 5-cm intervals and transferred to precleansed glass bottles. Surficial sediments were collected with an Ekman dredge. The samples were stored at 4 C and analyzed within a week post collection. Total Hg was determined on undried samples by wet digestion with H2S04/HN03 and subsequent flameless atomic absorption spectrophotometry. A sub-sample was freeze dried and used for the determination of organic C, free iron oxides extractable with citrate-dithionite-bicarbonate, and CaCO3. The pH of undried sample was measured with a glass electrode. All results were expressed on an oven-dry basis. For the Madison lakes, the trends in Hg distribution were related to variations in sewage inputs during the last 80 yr. It is unlikely that either inputs of sewage or erosional products are responsible for the observed accumulation of Hg in the most recent sediments from three lakes in northeastern Wisconsin. Background levels varied from 0.01 to 0.24 ppm Hg (intact sediment basis) in precultural sediments from the Wisconsin lakes investigated. There was no consistent relationship between the concentration of Hg and other sediment components

otential importance in the retention of Hg. Holoman-Battelle)
/73-13264

PTAKE AND ACCUMULATION OF DDT AND CB BY EPHEMERA DANICA (EPHEMEROP-ERA) IN CONTINUOUS-FLOW SYSTEMS,
und Univ. (Sweden). Dept. of Zoology.
or primary bibliographic entry see Field 05C.
/73-13265

ETHYLMERCURY: BACTERIAL DEGRADA-ION IN LAKE SEDIMENTS,
idwest Research Inst., Kansas City, Mo.
. J. Spangler, J. L. Spigarelli, J. M. Rose, and H. . Miller.
cience, Vol 180, No 4082, p 192-193, April 13, /73. 3 fig, 11 ref.

escriptors: *Microbial degradation, *Lake sedi-ents, *Aquatic bacteria, *Mercury, Pseu-omonas, Cultures, Biodegradation, Mass spec-ometry, Michigan, Heavy metals, Pollutant entification.
entifiers: *Methylation, *Methylmercury, *Fate pollutants, Pure cultures, Volatilization, St. air River, Mixed cultures, Degradation oducts, Substrate utilization, Organomercury mpounds, Organometallics, Methane, Flame nization gas chromatography, Electron capture s chromatography.

ong-term incubation studies were carried out on e biomethylation of mercury in sediments taken om the delta area of the St. Clair River, ichigan. Various combinations of growth media d gaseous atmospheres were used in an effort to entify organisms or groups of organisms capable methylating Hg. During the first 50 days of a ng-term period of incubation of lake sediments th inorganic mercury (Hg (2 plus)), low concen-ations of methylmercury were observed to build . Upon continued incubation there was a rapid crease in amount of methylmercury in the stem and a concomitant evolution of volatile in-ganic mercury (Hg). Transfer of the mixed cul-re to growth media containing methylmercury sulted in the degradation of methylmercury and e volatilization of Hg. Four bacterial isolates ere obtained from the mixed culture which, in re culture, rapidly degraded methylmercury to ethane and Hg. The presence of methane in head ace gases was confirmed by flame ionization gas romatography, and the presence of Hg in head ace gases was confirmed by mass spectrometry. Ioomoman-Battelle)
/73-13267

ULPHATE DEPOSITION BY PRECIPITATION TO LAKE ONTARIO,
tmospheric Environment Service, Toronto (On-rio).
W. Shaw, and D. M. Whelpdale.
ater, Air, and Soil Pollution, Vol 2, No 1, p 125-8, March 1973. 2 tab, 7 ref.

escriptors: *Sulfates, *Water pollution sources, Precipitation (Atmospheric), *Snowfall, *Lake ntario, Chemical analysis, Specific conductivity, me, Hydrogen ion concentration, Sampling, Pol-tants.
entifiers: *Fate of pollutants.

mples of falling precipitation were collected ree times at eleven sites along western Lake On-rio. Care was taken that the sampling was done ring periods of prolonged, continuous precipita-n and also that the collectors (suitably cleaned lyethylene pails) were set out and taken in thin approximately 1 hr of the beginning and end the precipitation, from individual snow storms several hours duration indicate that approxi-ately 9-66 mg/sq m of sulfate is being deposited r storm. Using a mean sulfate concentration in precipitation in this region (throughout the year) of 4 mg/l and an annual accumulation of precipitation of 760 mm, the total annual deposition of sulphate by precipitation alone is almost 3 g/sq m, or a total of 4,000 metric tons over the western end of the Lake. The annual deposition of sulfate by precipitation is, therefore, about 0.1 percent of the total mass of sulfate. This is significantly of the same order of magnitude as that discharged directly into the Lake by industry. (Holoman-Battelle)
W73-13270

PERSISTENCE OF VIRUS AND BACTERIA IN SEAWATER,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 05C.
W73-13272

CHLORINATED HYDROCARBONS IN PLANKTON FROM THE GULF OF MEXICO AND NORTHERN CARIBBEAN,
Texas A and M Univ., College Station, Dept. of Chemistry.
C. S. Giam, M. K. Wong, A. R. Hanks, W. M. Sackett, and R. L. Richardson.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 6, p 376-382, June 1973. 2 fig, 1 tab, 15 ref.

Descriptors: *Plankton, *Polychlorinated biphenyls, *DDT, Chlorinated hydrocarbon pesticides, Sampling, *Gulf of Mexico, Chemical analysis, Solvent extractions, Pollutant identification, Marine animals, Marine plants, Zooplankton, Phytoplankton, Sea water.
Identifiers: *Metabolites, *Caribbean Sea, Electron capture gas chromatography, Sample preparation, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Detection limits.

During 1971 and 1972 a baseline study of pollutants in the open Gulf of Mexico and Northern Caribbean, sponsored by the International Decade of Ocean Exploration, was conducted. Plankton samples were collected over extensive areas of the Gulf of Mexico and Northern Caribbean. The samples were analyzed by electron capture gas chromatography for DDT, its metabolites and PCBs, in order to determine the concentration and distribution of these contaminants in the lowest levels of the marine food chain. From the results, it appears that DDT's and PCB's are widely spread but at a low level. There were few discernible geographic trends in the sampled areas. About 70 percent of the samples gave higher PCB than DDT values. No definite trend can be observed from the PCB/DDT ratio of the samples analyzed. Generally, the total DDT and PCB levels in plankton samples is comparable to that in small whole fish and muscle of some larger fish. (Holoman-Battelle)
W73-13273

COMPARATIVE EXTRACTION OF CHLORINATED HYDROCARBON INSECTICIDES FROM SOILS 20 YEARS AFTER TREATMENT,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
R. G. Nash, W. G. Harris, P. D. Ensor, and E. A. Woolson.
Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 728-732, May 1973. 8 tab, 14 ref.

Descriptors: *Soil analysis, *Pesticide residues, *Chlorinated hydrocarbon pesticides, Aldrin, Dieldrin, Endrin, Heptachlor, DDT, Separation techniques, Gas chromatography, Statistical methods.
Identifiers: *Shake extraction, *Soxhlet extraction, Column extraction, Isodrin, Chlordane, Toxaphene, BHC, Delan, Heptachlor epoxide, Nonachlor, Lindane, Sample preparation, Gas liquid chromatography, Endrin ketone, Endrin alcohol, Endrin aldehyde, Organic solvents, Isomers.

Three methods, shake, Soxhlet, and column, were compared for efficiency of extraction of certain chlorinated hydrocarbon insecticides from a Congaree sandy loam soil which had been treated 20 years earlier. Column extraction had a tendency to be less efficient than the other 2 methods, but statistically there were no differences in extraction efficiences among the 3 methods for aldrin, dieldrin, heptachlor, chloradane, isodrin, endrin, toxaphene, or Dilan and their residue products. However, shake extraction was significantly more efficient for the BHC isomers than Soxhlet extraction and the latter was significantly more efficient than column extraction. (Little-Battelle)
W73-13285

ECOLOGY OF TWO RELATED SPECIES OF CADDIS FLY LARVAE IN THE ORGANIC SUBSTRATES OF A WOODLAND STREAM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
R. J. MacKay, and J. Kalff.
Ecology, Vol 54, No 3, p 499-511, Late Spring 1973. 5 fig, 9 tab, 30 ref.

Descriptors: *Caddisflies, *Larvae, *Organic matter, Ecology, *Aquatic habitats, *On-site tests, *Laboratory tests, Detritus, Leaves, Natural streams, Animal populations, Niches, Aquatic insects, On-site investigations, Invertebrates, Water sampling.
Identifiers: *Woodland stream, *Substrate utilization, Food sources, Surber sampler, Sample preservation, Pcynopsyche luculenta, Pycnopsyche gentilis, West Creek, Substrates, Macroinvertebrates, Detritivores, Sympatric species.

Two species of Pycnopsyche larvae inhabiting allochthonous organic materials in West Creek are contemporaneous and similar in size. Field studies and laboratory experiments show that about 90% of P. gentilis larvae live in fallen leaves, which they use as food and for case materials; the remaining 10% occur in detritus with P. luculenta. P. luculenta can utilize leaves or woody materials; 50% of the population is in detritus, and 50% is in more leafy habitats, but not far from detritus. The distribution of each species from September through March depends on the amount of preferred habitat space available. Larvae in leafy habitats are washed downstream during the spring thaw by habitat displacement. In 1971, two-thirds of the P. gentilis population and nearly half the P. luculenta population were displaced. The subsequent shortage of leafy habitat space and crowding of remaining larvae may result in competitive interaction and predation by grackles. In the laboratory, both species feed preferentially on leaves that decay quickly, especially on leaves infected with fungi. Dry weights of leaf tissue ingested per larva in 24 hours frequently exceed 50% of the dry body weight of the larva. P. luculenta ingests less leaf material if twigs are available. The niche size of P. gentilis is smaller than that of the P. luculenta. There is some niche overlap, but it apparently does not normally result in harmful competition between the species. (Mortland-Battelle)
W73-13286

NITROGEN METABOLISM IN THE SEA.
Lamont Geological Observatory, Palisades, N.Y.

Available from the National Technical Information Service as COO-3222-2, $3.00 in paper copy, $1.45 in microfiche. Technical Progress Report, October 31, 1972. 249 p, 20 fig, 14 tab, 9 ref, 3 append. Contract No AEC-AT (11-1)3222.

Descriptors: *Radioactivity techniques, *Nitrogen, *Phytoplankton, *Zooplankton, *Metabolism, Sea water, Primary productivity, Water quality, Sampling, Systematics, Nets, Sieves, Nitrates, Nitrites, Ammonia, Silicates, Dissolved oxygen, Hydrogen ion concentration, Water temperature, Salinity, Alkalinity, Nutrients, Carbon, Cultures, Copepods, Dinoflagellates, Phosphates, Food chains, Absorption, Cycling nutrients, Amphipoda, Marine algae, Protozoa, Invertebrates, Marine animals, Crustaceans, Larvae, Mollusks, Gastropods, Diatoms.
Identifiers: N-15, Pteropods, Chaetognaths, Appendicularia, Siphonophores, Medusa, Euphausiids, Macroinvertebrates, Coelenterates, Tunicates, Nitrogen radioisotopes, Decapods, Coccolithophores, Sample preservation, On board analysis, Chaetoceros simplex, Monochrysis lutheri, Coccolithus huxleyi, Artemia salina.

A combination of daily measurement of standing stocks and rates derived from N-15 uptake experiments was used in determining rates of nitrogen flux during the initial stages of the annual increase in productivity at a station off Bermuda. The nitrogen flux during the first stage of the annual nitrogen cycle was chosen for examination. Samples were collected daily for a period of three weeks. Standing stock measurements of all particulate nitrogen from 0.45 - 10,000 microns were made on samples collected with water bottles and plankton nets. Measurements of dissolved inorganic nitrogen, other nutrients, salinity, and temperature were made on samples taken with water bottles equipped with reversing thermometers. Three preliminary experiments were done with N-15-labeled phytoplankton to measure the rate of nitrogen transfer from primary producers to herbivores. A program was initiated to collect and maintain zooplankton cultures for continuation of N-15 tracer studies under laboratory conditions. It was concluded that both methods should be used to understand the nitrogen flux in an ecosystem. The standing stock method is at the lower limits of its sensitivity when production and changes in standing stock are small. The N-15 method may be used more successfully under such conditions. (Mortland-Battelle)
W73-13292

A REPORT ON BACTERIAL POLLUTION AFFECTING SHELLFISH HARVESTING IN NEWPORT RIVER, NORTH CAROLINA.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.

Available from the National Technical Information Service as PB-215 291, $3.00 in paper copy, $1.45 in microfiche. Report, April 1972. 43 p, 10 fig, 11 tab, 11 ref, 2 append.

Descriptors: *Water pollution effects, *Water quality standards, *Water analysis, *Water pollution sources, *Shellfish, *Shellfish farming, Tributaries, Domestic wastes, Waste disposal, Coliforms, Treatment facilities, Estuaries, Waste water treatment, E. Coli, Chlorination, Water sampling, Bioindicators, Biochemical oxygen demand, Suspended solids, Carbon, Nitrogen, Organic matter, Dyes, Soil analysis, Water pollution, Water quality, Septic tanks, Chlorine, Enteric bacteria, Sediments, Chlorides, Phosphorus, Chemical oxygen demand, *North Carolina.
Identifiers: *Newport River (NC), Fecal coliforms, Fecal pollution, Fecal streptococci, Grease, Salmonella bredeney, Salmonella reading, Salmonella anatum, Salmonella muenchen.

An intensive bacteriological monitoring program has been conducted in shellfish harvesting areas of the Newport River in North Carolina. Levels of bacterial indicators in the river's estuary and tributaries are reported and where possible, sources of the indicators are identified. Two treatment plants were major domestic waste sources but it was determined that if they operated continuously at the same efficiency as during the study they did not pose an immediate threat to shellfish growing areas. Other sources of contamination identified were wildlife, agricultural runoff, and septic tanks. In those areas of the River classified for shellfishing, each station monitored was in violation of the established criteria of the USPHS standard (median total coliform not to exceed 70/100 ml and not more than 10 percent exceed an MPN of 230/100 ml). (Mortland-Battelle)
W73-13298

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED POROUS MEDIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. K. Tyagi.
Technical Report No. 9, 1972, 125 p, 261 ref. OWRR B-020-ARIZ (1). 41-31-0001-3555.

Descriptors: Moisture, *Unsaturated flour, *Porous media, Theoretical analysis, *Reviews, Numerical analysis, Dispersion, *Water quality, Finite element analysis, Hydraulic conductivity, *Bibliographies, *Path of pollutants, Soil moisture.
Identifiers: Dispersion coefficient, *Unsaturated soils.

The available literature is reviewed in two parts - the movement of water in unsaturated soils and the simultaneous transfer of water and pollutants in unsaturated soils. Papers pertain to theoretical analysis, laboratory study, and field work on the two problems. An appendix lists the references, categorizing the kinds of study by various investigators.
W73-13302

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS,
Washington State Univ., Pullman. Coll. of Engineering.
J. C. Sheppard.
Available from NTIS, Springfield, Va., as RLO-2221-T-3-3; $4.00 in paper copy, $1.45 in microfiche. Report RLO-2221-T-3-3, Feb. 1973. 33 p, 15 fig, 1 tab, 4 ref. AEC-AT (45-1)-2221 Task 3.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Neutron activation analysis, *Environmental effects, Sedimentation basins (Waste disposal), Zinc, Titanium, Water pollution sources, Organic compounds, Carbon radioisotopes, Tracers, Radioisotopes, Radioactivity techniques, Effluents, *Path of pollutants.

Neutron-activation analysis was used in determining the fate of TiO2 and ZnO in an operating paper mill. Analysis of low levels of Ti in the effluents indicated that most Ti was recycled before reaching the final clarifier. Clay filler bleached with Zn hydrosulfite retained the Zn such that soluble Zn was not present in the effluent. The use of C14 labelling to trace organic additives is suggested since attempts to tag them with metal ions were found to have limitations. A microtome-sectioning, neutron-activation method was used to determine the distribution of additives in paper, and preliminary experiments indicated that the conjunctive use of ion-scattering at paper surfaces may be useful. Analysis of paper for clay filler using an (Am241)-Be source was not better than the conventional ashing method. (Bopp-ORNL)
W73-13338

TERRESTRIAL PLANT ECOLOGY.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

Available from NTIS, Springfiled, Va., as BNWL-1970, Vol. 1, Pt. 2; $4.00 paper copy, $1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt 2, March 1973, Section 7. 11 p, 4 fig, 5 tab, 20 ref.

Descriptors: *Grasslands, *Semiarid climates, *Water utilization, *Fertilization, Forecasting, On-site data collections, Cycling nutrients, Absorption, Phosphorus, Phosphorus radioisotopes, Sulfur, Hydrogen ion concentration, Soil contamination, Radioactivity, Lysimeters, Nuclear wastes, Ecology, Radioecology, Plant growth, Washington.

Soil disturbances from wildfires or radioactive-waste burial tend to be stabilized by cheatgrass colonization. Cheatgrass appears to be more efficient in utilizing soil water and nutrients than the native safegrass and bunchgrass. Data collected over 4 yr permits predicting the effect of nitrogen fertilizer on cheatgrass growth as a function of the moisture, nitrate, and ammonia present in the soil. The soil in the vicinity of the canopy spread of the shrub halophyte greasewood is enriched in sodium by leaf drop, also in P and S, and the pH is increased. These changes reduced uptake of Zn65, P32, and S35 by barley shoots but did not affect uptake of Ca45. Small lysimeters were used to study water use by herbage. (Bopp-ORNL)
W73-13340

FRESHWATER ECOLOGY.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; $4.00 in paper copy, $1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt 2, March 1973, Section 6. 26 p, 10 fig, 10 tab, 11 ref.

Descriptors: *Radioactivity effects, *Tritium, *Absorption, *Thermal pollution, Freshwater fish, Invertebrates, Algae, Rainbow trout, Radioecology, Food chains, Food webs, Nuclear wastes, Infection, Fish diseases, Organic compounds, Path of pollutants, Water pollution effects.

Uptake of tritium from 1 microCurie/liter of tritiated water solution reached a maximum in about 5 months in tissues of most aquatic organisms. Organically bound tritium was 7-21% of the total in mussel, crayfish, carp, and filamentous algae; 4-12% in emergent vegetation. One month after termination of the experiment, only trace activities were measured in most tissues, but 30-40% of their label was retained by filamentous algae and emergent vegetation; after 8 months, 10% was retained by vegetation. In continuing studies on (sublethal) effects of chronic low-level irradiation, the immune capacity of juvenile and yearling rainbow trout against a naturally occurring bacterial antigen was suppressed following tritium irradiation during embryogenesis. Combined effects of temperature and other environmental stresses on fish and invertebrates were studied. (Bopp-ORNL)
W73-13341

CHARACTERISTICS OF HANFORD SOIL AND AQUATIC SEDIMENTS.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; $4.00 in paper copy, $1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt 2, March 1973, Section 5. 6 p, 2 fig, 14 ref.

Descriptors: *Mercury, *Water analysis, *Suspended solids, *Soil-water-plant relationships, Path of pollutants, Columbia River, Seasonal, Grasslands, Grazing, Mathematical models, Forecasting, Soil moisture, Soil temperature, Carbon cycle, Carbon dioxide, Soil gases, Thermal pollution, Water pollution, Runoff.

Spring grazing over a 2-year period reduced carbon dioxide evolution from soil, probably by reduction of root respiration. A preliminary model correlated seasonal changes in carbon dioxide evolution with soil temperature (20 cm) and soil moisture (0-8 cm), both for grazed and ungrazed soils. Hg in water and suspended matter from the Columbia River and its tributaries was measured over a one-year period. Hg in suspended matter was highest during the winter periods of relatively low-water levels and minimum terrestrial runoff. Concentrations in sediments behind dams were lower than in suspended matter from the same locations. (Bopp-ORNL)
W73-13342

MARINE SCIENCES.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; $4.00 in paper copy, $1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt 2, March 1973, Section 3. 8 p, 5 fig, 4 tab, 10 ref.

Descriptors: *Thermal pollution, *Radioactivity effects, *Marine fish, *Oysters, Fish eggs, Tritium, Effluents, Washington, Estuarine environment, Pacific Coast Region, Lethal limit, Oceanography, Trace elements.

Effects from canal discharge of powerplant cooling water were assessed in two types of experiment: (1) Lethal temperature were determined (28-31 degrees) for various rates of heating of marine fish (0.2-2 degrees/min) collected near shore and acclimated to 10 degrees, and (2) lethal exposure times (10-100 min) were determined at 26-30 degrees. Oyster eggs were exposed for 48 hr in seawater containing 0.01-1 microCurie/ml of tritium (the calculated dose was 0.0038-0.54 rads). There was no effect on egg development. Participation in the Geochemical Ocean Sections Study is reviewed. (Bopp-ORNL)
W73-13343

PLUTONIUM STUDIES.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; $4.00 in paper copy, $1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt 2, March 1973, Section 2. 8 p, 1 fig, 3 tab, 5 ref.

Descriptors: *Nuclear wastes, *Vegetation, *Absorption, *Food chains, Public health, Path of pollutants, Monitoring, Soil bacteria, Chelation, Soil fungi, Soil microorganisms, Actinomycetes, Cytological studies, Soil contamination, Nevada, Organic compounds, Analytical techniques, Radioactivity techniques, Anaerobic bacteria, Sampling, Optimization, Statistics.

Sampling designs were formulated to inventory soil for Pu at Enewetok Atoll and the Nevada Test Site. Complexing with processing chemicals generally increased uptake of Nevada-Test-Site vegetation from contaminated soil in the case of Np and Pu, but decreased uptake of Am and Cm. Apparatus was designed to expose plants to Pu aerosols and maintain them in environmental chambers. Plant uptake of Cs137 was much greater from organic mud than predicted from data for simply contaminated soil. Effects will be studied of Pu on soil bacteria, actinomycetes, fungi, and soil respiratory activity. Methods were developed for determination of Pu in plant and microbial tissues and soils and for the distribution of Pu in microbial exocellular solution and within the cell. (Bopp-ORNL)
W73-13344

RADIONUCLIDE DECLINE IN COLUMBIA RIVER WATER.
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; $5.45 in paper copy, $1.45 microfiche. In: Report BNWL-1751, Vol 2, Pt 2, p 81-84, April 1973. 3 tab, 4 fig.

Descriptors: *Sediments, *Sedimentation, *Radioisotopes, *Columbia River, Nuclear wastes, Path of pollutants, Cores, Sediment transport, Deposition (Sediments), Radioactivity techniques.

Shutdown of the original Hanford production reactors has greatly reduced radionuclide discharge to the Columbia River; however, resuspension of radionuclides in sediments will continue for several years. Decreases in several radionuclides were measured between August 1971 and September 1972 in water sampled at McNary Dam (Sc46, 90-fold; Zn65, 9-fold; Mn54, 6-fold); but only small decreases for long-lived radionuclides (Co60, Cs137, and Eu152). The transport of eight gamma emitters (totalled) past Bonneville Dam decreased 10-fold between the fall of 1971 and the fall of 1972. In agreement with a prediction from the Zn65/Co60 ratio in sediment cores obtained earlier, examination of recent cores showed deposition of 15 cm between April 1971 and February 1972 in McNary Reservoir. (Bopp-ORNL)
W73-13345

DETERMINATION OF AG, HG, AND ARSENIC IN SEAWATER.
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; $5.45 in paper copy, $1.45 microfiche. In: Report BNWL-1751, Vol 2, Pt 2, p 24-28, April 1973. 2 tab.

Descriptors: *Analytical techniques, *Water analysis, *Trace elements, Mercury, Silver, Arsenic, Neutron activation analysis, Spectrophotometry, Chemical precipitation, Chemical reactions, Oxidation-reduction potential, Oxidation, Reduction (Chemical), Sea water, Pollutant identification.

The precision of an ion exchange-neutron activation method for Ag was about 10% at a concentration of 0.01 unit (micrograms/liter). The Hg in a 100-ml sample of seawater was reduced with Sn (Cl)2 and measured in a 3-cm-diameter x 17-cm-long optical absorption cell. A several day treatment of the seawater with oxidizing agent converted non-ionic to ionic forms, increasing the yield on reduction with Sn (Cl)2. The precision was about 10% at a concentration of 0.05 unit. The As in a 100 ml sample was coprecipitated with Fe (OH)3, dried, and analyzed by neutron activation. The precision was about 5% at a concentration of 1.8 units (the average found in ocean depth profiles). Ag in surface waters ranged from 0.0035 to 0.047 unit. Hg in a single surface sample from the Oregon coast was 0.011; at a depth of 50 meters, 0.049. (Bopp-ORNL)
W73-13346

IRON-55 IN THE HUMAN POPULATIONS OF THE WORLD.
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; $5.45 in paper copy, $1.45 microfiche. In: Report BNWL-1751, Vol 2, Pt 2, p 47-49, April 1973. 1 tab.

Descriptors: *Iron, *Sea water, *Marine animals, *Phytoplankton, Radioactivity techniques, Crustaceans, Marine fish, Analytical techniques, Chemical precipitation, Fallout, Nuclear wastes, Food chains, Public health, Path of pollutants, Pacific Coast Region, Atlantic Ocean, Atlantic salmon, Pacific Ocean, Salmon, Pacific Northwest U.S.
Identifiers: Iron radioisotopes.

The rate of decline of Fe55 in salmon paralleled that in the stratosphere. It is tentatively concluded that a 10-30 fold lower Fe55 specific activity in surface-feeding fish for midlatitudes as compared with northern latitudes (although the Fe55 content of the seawater is higher) results from a higher stable Fe content of the seawater. The analytical technique for concentrating Fe from large volumes of seawater consisted in coprecipitation with MnO2. In several marine animals from the Washington and Oregon coasts the Fe55 specific activity ranged from 0.4 to 1800 disintegrations/(minute, mg Fe); in plankton, 600. (Bopp-ORNL)
W73-13347

FATE AND EFFECTS OF RADIONUCLIDES IN ALASKA.
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; $5.45 in paper copy, $1.45 microfiche. In: Report BNWL-1751, Vol 2, Pt 2, p 10-11, April 1973.

Descriptors: *Arctic regions, *Alaska, *Radioisotopes, *Food chains, Absorption, Public health, Fallout, Lichens, Mosses, Radioecology, Mammals, Big game, Food webs, Terrestrial habitats, Radioactivity effects, Environmental effects, Ecology, Cold regions.
Identifiers: Sodium radioisotopes, Cesium radioisotopes.

Radionuclides transferred through the lichen-caribou-man food web that are found in soft tissue include Na22 and Cs137, which account for most of the dose to an Arctic resident; and also Fe55, Zn65, Ag110m and Po210. Those removed from further transport by deposition in bone are Mn54, Sr90, Pb210, and Ra226. The contribution of lichen and moss to the radionuclide content of food webs is somewhat lower in moose-forest ecosystems than in caribou-Arctic ecosystems. The shorter-lived radionuclides are more important for the moose-forest ecosystems. (Bopp-ORNL)
W73-13348

ANNUAL SCIENTIFIC REPORT 1971 (RADIOACTIVE AND NON-RADIOACTIVE CONTAMINATION OF THE ENVIRONMENT AND THE METABOLISM OF SOME RADIOELEMENTS; RADIOPHYSICAL CONTROL; RESEARCH ON BODY CONTAMINATION; WASTE DISPOSAL RESEARCH; N ON--RADIOACTIVE ENVIRONMENTAL POLLUTION).
Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).

Report available from NTIS, Springfield, Va., as EURFNR-1063; $10.60 in paper copy, $1.45 microfiche. In: Report EURFNR-1063, 1972. Section 3, p 55-58 and Section 4, p 1-7. 2 tab.

Descriptors: *Nuclear wastes, *Waste water treatment, *Radioecology, *Milk, Freshwater fish, Food chains, Path of pollutants, Soil-water-plant relationships, Ion exchange, Ion transport, Absorption, Strontium radioisotopes, Tritium, Cobalt radioisotopes, Pastures, Sediments, Marine algae, Lead, Mercury, Toxicity, Public health, Potable water.
Identifiers: Ruthenium radioisotopes, Manganese radioisotopes.

After contamination of pastures by Ru106 as chloride, fixation on organic and fine-mineral soil fractions at 0-5 cm depth was greater than by sand at lower depth. Soil water collected in lysimeters did not change in Ru106 activity with depth. Uptake of Sr85 by plants increased with increasing organic matter in soils, and decreased with increasing clay. Milk from cows fed with hay from contaminated pastures was 10-20 times higher in tritium as compared with milk from cows given tritiated water. The uptake of tritium by marine algae was studied, as was the uptake of Mn54 and Co60 by freshwater fish, moss, and sediment. The uptake of various Ru salts by freshwater organisms was also studied. Pilot-plant-scale studies were made of nuclear waste decontamination by ion exchange. Removal of Pb and Hg from wastes by FeS precipitate in ion-exchange columns was tested. The toxicity of Pb in drinking water is being studied. (Bopp-ORNL)
W73-13349

VISCOUS FINGER WAVELENGTH DEGENERATION IN HELE-SHAW MODELS,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 02F.
W73-13375

SIMULTANEOUS TRANSPORT OF SOLUTES AND WATER UNDER TRANSIENT UNSATURATED FLOW CONDITIONS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil Physics.
For primary bibliographic entry see Field 02G.
W73-13380

COPPER ACCUMULATION IN SOILS USED FOR HOP GROWING IN BAVARIA, (IN GERMAN),
Technische Hochschule, Munich (West Germany).
W. Rieder, and U. Schwertmann.
Landwirtsch Forsch. Vol 25, No 2, p 170-177. 1972. English summary.
Identifiers: *Copper, Fungicides, *Germany (Bavaria), Growing, Iron, Manganese, Soils, *Wheat (Hop growing).

Due to the extensive use of Cu-containing fungicides, Cu is highly accumulated in these soils. Topsoil of 8 profiles with 7-16% clay contained more than 500 ppm total Cu after up to 43 yr of fungicide applications. The annual accumulation averaged 12.1 ppm Cu. Practically no Cu reached the groundwater. Of the Cu accumulated, 90% was soluble in 0.05 M EDTA or 0.43 N HNO3 both commonly used for the extraction of 'plant available' Cu. Exchangeable Cu increased from <1 ppm to 7 ppm Cu. The relationship between pCu (exchangeable) and pH was linear between pH 4.5-6.5 with a slope pCu/pH of approximately 0.5 indicating a reaction between one Cu2+ and 2 H+. Liming the soil above pH 6.5 does not seem to reduce the exchangeable Cu significantly. Native total Cu was highly correlated with clay ($r \pm 0.975$) and total Fe ($r \pm 0.985$). A Neubauer experiment with summer wheat indicated no detrimental effect of a high Cu content in the soil but compared to a normal soil the uptake of Fe and particularly of Mn by the plant was significantly reduced.--Copyright 1973, Biological Abstracts, Inc.
W73-13395

CONTENTS OF TRACE ELEMENTS IN LUCERNE (MEDICAGO VARIA MART) IN RELATION TO GROWTH, DEVELOPMENT AND WEATHER CONDITIONS IN 3 YEARS OF EXPERIMENT, (IN GERMAN),
Technische Universitaet, Munich (West Germany). Institut fuer Gruenlandlehre.
G. Voigtlaender, V. Lang, and M. Kirchgessner.
Z Acker-Pflanzenbau. Vol 135, No 3, p 204-215. 1972. Illus. English summary.
Identifiers: Cobalt, Copper, Growth, Iron, *Lucerne clone, Manganese, Medicago-Varia, Milk, Molybdenum, Radiation, Temperature, *Trace elements, Weather, Zinc.

The initial growth of a lucerne clone was analyzed from the beginning of growth to full flowering for its content of Co, Mo, Cu, Mn, Zn and Fe. The results of the analyses and the corresponding data for temperature, rainfall and radiation were analyzed by factor analysis and multiple regression analysis. With increasing plant age the content of Mo, Cu, Zn, Mn, and Fe diminished. Higher total values for radiation and temperature were associated with higher contents of Mo and Cu but with lower contents of Mn. The requirements of Fe and Mo in a milk cow were met throughout the growth period. The Cu and Zn contents fell below the required concentration when the height reached 50 cm. The Mn contents remained below the normal requirements throughout. In the majority of cases a deficiency in the supply of Co is also to be expected.--Copyright 1973, Biological Abstracts, Inc.
W73-13396

SURVEY OF ENVIRONMENTAL RADIOACTIVITY, JANUARY 1-DECEMBER 31, 1972,
Ames Lab., Iowa.
M. D. Voss.
Available from NTIS, Springfield, Va., as Report No IS-3048; $4.00 per paper copy, $1.45 microfiche. Report No IS-3048, Feb 1973. 44 p.

Descriptors: *Environmental control, *Radioactivity, *Measurement, *Radioisotopes, *Assay, Effluent, Nuclear powerplants, Rivers, Air pollution, Water pollution, Soil contamination, Sediments, Vegetation, Fallout, Precipitation (Atmospheric), Ponds, Streams, *Iowa.
Identifiers: Skunk River (Iowa), Squaw Creek (Iowa).

The environmental monitoring program of the Ames Laboratory of the USAEC including the Ames Laboratory Research Reactor (ALRR) is described. The environmental program consists of determinations of gross alpha and beta radioactivity in air, soil, vegetation, river water, ALRR outfall, bottom sediment, precipitation, well water, and pond water samples. Off-site environmental air is routinely monitored at a station atop the Research Building, Iowa State University campus, Ames, Iowa. The alpha and beta radioactivity in stream water was determined upstream and downstream from the confluence point of streams forming the drainage pattern from the ALRR. There is no measurable radioactivity in the stream water samples attributable to Ames Laboratory operations. (Houser-ORNL)
W73-13402

MODEL OF THE ACCUMULATION OF FOSSIL CO2 IN THE ATMOSPHERE AND THE SEA,
Washington Univ., Seattle. Dept. of Chemistry.
A. W. Fairhall.
Available from NTIS, Springfield, Va., as RLO-2225-T-20-8; $4.00 in paper copy, $1.45 in microfiche. Report RLO-2225-T-20-8, 1972. 16 p, 3 fig, 13 ref.

Descriptors: *Carbon radioisotopes, *Carbon dioxide, *Calcium carbonate, Hardness (Water), Calcite, Nutrient cycling, Boron, Calcium, Atmosphere, Air pollution effects, Water pollution effects, Mixing, Marine biology, Oceans, Chemical precipitation, Chemistry of precipitation, Ions, Absorption, Turnovers, Mathematical models, Public health, Fossil fuels, Nuclear powerplants, Tracers, Forecasting, Future planning (Projected), Ecology, Radioecology, Oceanography.

Absorption of CO2 from burning fossil fuel is predicted to cause the mixed layer of the oceans to become unsaturated with respect to calcium carbonate, by the year 2010 in one model and well into the next centruy by a second To avoid harm to calcarious organisms, leveling off fuel consumption by the year 2000 should be considered. The first model is based on the controversial hypothesis of free absorption of carbon dioxide; the second model is based on limitation of absorption by ionic equilibria. The first model is supported both by the observation in the atmosphere of only about one-third the annual carbon dioxide emission from fuel, and by the decrease of C14 in tree rings. (Bopp-ORNL)
W73-13403

USE OF HANFORD WASTE PONDS BY WATERFOWL AND OTHER BIRDS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05C.
W73-13404

AMCHITKA BIOENVIRONMENTAL PROGRAM. RESEARCH PROGRAM ON MARINE ECOLOGY, AMCHITKA ISLAND, ALASKA, JULY 1, 1971-JUNE 30, 1972,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05C.
W73-13405

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SURRY POWER STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13408

AQUATIC, BIOENVIRONMENTAL STUDIES IN THE COLUMBIA RIVER AT HANFORD 1945--1971. A BIBLIOGRAPHY WITH ABSTRACTS,
Battelle-Pacific Northwest Labs., Richland, Wash.
C. D. Becker.
Available from NTIS Springfield, Va., as Report No. BNWL-1734; $7.60 per copy, $1.45 microfiche. Report BNWL-1734, Feb. 1973. 153 p, 416 ref.

Descriptors: *Nuclear powerplants, *Effluents, Water pollution, *Bibliographies, Abstracts, *Water pollution sources, *Columbia River, Washington, Biology, Metabolism, Aquatic environment, Aquatic life, Effects, Assay, Radioactivity, Hydrology, Public health, Food chains, Ecosystem.
Identifiers: *Hanford site (Wash).

Publications prepared by Hanford staff scientists that deal with bioenvironmental studies in the central Columbia River during the period 1945 to 1971 are listed and abstracted. Four general topics are covered: (1) biology and ecology of river organisms, (2) thermal and chemical effects of reactor effluent discharges, (3) radioactivity releases from reactor operations, and (4) hydrology of the Columbia River. Over 400 publications are included. The abstracts provide an insight into the scope and depth of diverse studies supported by the United States Atomic Energy Commission in order to evaluate any impact on the aquatic ecosystem throughout the 'plutonium production phase' of the Hanford operations. (Houser-ORNL)
W73-13409

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE ST. LUCIE PLANT UNIT NO. 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13410

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE CONTINUATION OF CONSTRUCTION OF UNIT 2 AND THE OPERATION OF UNITS 1 AND 2 MILLSTONE NUCLEAR POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13411

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE CONSTRUCTION OF SUSQUEHANNA STEAM ELECTRIC STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13412

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF NINE MILE POINT NUCLEAR STATION UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13413

RADIOACTIVE WASTE MANAGEMENT - A BIBLIOGRAPHY OF PUBLICLY AVAILABLE LITERATURE PERTAINING TO THE USAEC'S HANFORD, WASHINGTON PRODUCTION SITE.
Technical Information Center (AEC), Oak Ridge, Tenn.

Available from USAEC, Tech Inf Center, Oak Ridge, Tenn., as Report TID-3340. Free. Report No. TID-3340, Aug 1973. 160 p, 1098 ref.

Descriptors: *Bibliographies, *Abstracts, *Radiation, *Radioactive wastes, *Radioactive waste disposal, Management, Washington, Meteorology, Ecology, Hydrology, Radioecology, Water pollution, Water pollution sources, *Columbia River, Groundwater, Surface waters, Monitoring, Assay, Public health, Administrative agencies.
Identifiers: *Hanford site (Wash).

This bibliography contains abstracts of 1098 technical reports and journal articles which have appeared in Nuclear Science Abstracts from January 1951 through July 1973 pertaining to radioactive waste management at the Hanford site. The abstracts are grouped into ten categories. Within the categories, they are arranged by NSA volume and abstract number and cover subjects as follows: (1) Environmental monitoring, ecology and radiological surveys, (2) Columbia River studies, (3) Ground disposal and soil studies, (4) Geology, hydrology, and meteorology, (5) Stack disposal, (6) Waste storage tanks and corrosion problems, (7) Waste fixation and solidification, (8) Waste processing and properties, (9) Waste management, (10) Miscellaneous. Recent classification reviews by the AEC have resulted in the declassification of additional documents not yet processed for inclusion in Nuclear Science Abstracts or yet made publicly available. A supplement to this bibliography will be issued in the near future when necessary processing has been completed. (Houser-ORNL)
W73-13414

EIGHTEENTH ANNUAL CONFERENCE ON BIOASSAY, ENVIRONMENTAL AND ANALYTICAL CHEMISTRY, OCT. 10-11, 1972, PROGRAM AND ABSTRACTS.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A.
W73-13415

Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

Available from NTIS, Springfield, Va., as EUR-5000f; $4.00 in paper copy, $1.45 in microfiche. Report EUR-5000f, May 1973. 23 p, 4 fig, 6 tab, 24 ref.

Descriptors: *Fallout, *Food chains, *Agriculture, *Path of pollutants, Irrigation effects, Vegetable crops, Crop response, Alfalfa, Wheat, Corn (Field), Cereal crops, Oats, Public health, Reviews, Soil contamination effects, Soil moisture, Soil properties, Potassium, Europe, Cation exchange, Absorption, Radioecology, Soil-water-plant relationships, Seasonal.
Identifiers: *Cesium radioiosotopes.

This review compares in-situ tests with pot studies. The correlation of Cs with K in vegetation found in pot studies was masked by the effect from variations in the K content of the soil encountered in the field. With both sandy and loamy soils transfer coefficients from soil to plants were 2-3 times less in in-situ than in pot studies when the concentration of available Cs in the soil was more than 1%, but the two types of studies were in better agreement at lower Cs concentration. Irrigation increased Cs uptake in in-situ studies since fixation of Cs by soil was decreased and root contact with suspended particles containing sorbed Cs was increased. The correspondence was found that a fallout value of 1 millicurie Cs137/sq km gave 4 picoCuries/kg in arable soil and 12 picoCuries/kg in prairie soil. Cs uptake by leafy vegetables was affected more by soil moisture and seasonal factors than uptake by wheat. (Bopp-ORNL)
W73-13416

SOIL CONTAMINATION. 2. PENETRATION OF RADIOACTIVE IONS PRESENT IN SOLUTIONS DUMPED ON THE SURFACE (CONTAMINATION DES SOLS. COMPORTEMENT DES IONS RADIOACTIFS DANS LES SOLS NON STURES),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
D. Rancon.
Available from NTIS, Springfield, Va., as CEA-R-3635 (2); $4.00 in paper copy, $1.45 in microfiche. Report CEA-R-3635 (2), Feb 1973. 50 p, 21 fig, 5 tab, 12 ref.

Descriptors: *Nuclear wastes, *Soil contamination, *Strontium radioisotopes, *Iodine radioisotopes, Waste disposal, Public health, Groundwater, Water quality control, Monitoring, Soil moisture, Soil analysis, Absorption, *Path of pollutants, Tracers, Radioactivity techniques, Leaching, Methodology.

After surface disposal of solutions containing radionuclides, radioactivity penetration into the soil was measured using instruments placed in pipes (see W72-00942 for prior work). Most I131 was retained near the surface, and washing by nonradioactive solutions removed only a small part. However, retention was reduced by the presence of NaI in solution (0.01 N) such that I131 could be used as a tracer of the front of water diffusion. Generally Sr85 sorption was much stronger than that of I131; however the presence of stable Sr and Ca in solution reduced Sr85 retention, and soil could be decontaminated of sorbed Sr85 by washing with solutions containing sufficient Ca. The effect of soil moisture on the radioactivity measurements was determined. (Bopp-ORNL)
W73-13417

PLANT ACCUMULATIONS OF RADIOACTIVE STRONTIUM WITH SPECIAL REFERENCE TO THE STRONTIUM-CALCIUM RELATIONSHIP AS INFLUENCED BY NITROGEN,
Danish Atomic Energy Commission, Risoe. Research Establishment.
A. J. Andersen.

Available from NTIS, Springfield, Va., as RISO-278; $5.45 in paper copy, $1.45 in microfiche. Report RISO-278, Jan 1973. 56 p, 4 fig, 6 tab, 100 ref.

Descriptors: *Soil-water-plant relationships, *Strontium radioisotopes, *Food chains, *Soil contamination effects, Radioecology, Path of pollutants, Fallout, Fertilization, Nitrates, Calcium, Soil properties, Legumes, Forage grasses, Phosphates, Agronomy, Absorption, Europe, Agriculture, Lime, Oats.
Identifiers: *Denmark.

A 10-year study of factors affecting Sr90 uptake by plants is summarized. Uptake varies between species but is generally higher for legumes than grasses. Uptake from heavy clay loam may be only 0.1 that from light sandy soil of low pH. Deep plowing may reduce uptake by shallow-rooted plants from 2- to 5-fold with loamy soil. Most Denmark soils have high Ca so that lime application proves ineffective; however phosphate application reduces uptake, possibly in part by forming Sr phosphates. There is little effect from K and Mg in fertilizer, but nitrate is a nutritional factor that affects the ability of plants to discriminate between Sr and Ca. Nitrate decreased the Sr/Ca ratio in oat plants grown both in water culture and in soil in pots. (Bopp-ORNL)
W73-13418

A SIMPLE MODEL OF STRONTIUM AND MANGANESE DYNAMICS IN A TROPICAL RAIN FOREST,
Argonne National Lab., Ill.
C. F. Jordan, J. R. Kline, and D. S. Sasscer.
Health Physics, Vol 24, p 477-489, May 1973. 7 fig, 5 tab, 20 ref.

Descriptors: *Fallout, *Strontium radioisotopes, *Rain forests, *Radioecology, Nuclear explosions, Excavation, *Path of pollutants, Runoff, Cycles, Public health, *Mathematical models, Computer models, Digital computers, Computer programs, Forecasting, Soil-water-plant relationships, Decomposing organic matter, *Puerto Rico, Absorption.
Identifiers: Manganese radioisotopes.

The fate of fallout radionuclides (including the case of an acute injection from the use of thermonuclear devices for excavations) was predicted by modelling measurements of Sr and Mn fluxes in ecosystem compartments. Measurements of fallout radionuclides in the forest validated the model. The turnover time of Sr90 was affected, in order of decreasing sensitivity, by the flow from litter to soil, the flow from canopy to litter, and rate of runoff. The shorter half-life for radioactive decay made Mn54 (312 days) more sensitive than Sr90 (28.8 years) to the quantity in the canopy, but the turnover time of Mn 54 was relatively insensitive to other parameters of the model. Radioactive decay is about three times as important as runoff in the elimination of Sr90 and accounts for 99% of the elimination of Mn54. The Sr90 activity in wood peaks about 12 years following a peak in fallout deposition. (Bopp-ORNL)
W73-13419

DISTRIBUTION OF CS137 IN SOILS AND VEGETATION ON THE ISLAND OF PUERTO RICO,
Argonne National Lab., Ill.
J. R. Kline, J. A. Colon, and S. S. Brar.
Health Physics, Vol 24, p 469-475, May 1973. 4 fig, 20 ref.

Descriptors: *Fallout, *Radioisotopes, *Rainfall, *Puerto Rico, Plants, Absorption plant physiology, Mountain forests, Ferns, Mosses, Lichens, Cycling nutrients, Public health, *Path of pollutants, Radioecology, Absorption.
Identifiers: *Cesium radioisotopes.

Only Ce144, Cs137, Mn54, and Zr95-Nb95 were detected by gamma spectroscopy in most samples in significant amounts, and only Cs137 is discussed in this report because of the similarity of distribution of the other nuclides (see also W73-04303). Levels in epiphytic plants (bromeliads, ferns, mosses, lichens, and liverworts) that derive their mineral nutrient requirements by interception of aerosols averaged 4.8 times those in most rooted plants. However, the hypothesis that aerosol scavenging by plants gave a major contribution to fallout interception was rejected except at localized mountain summit sites that are little used for agricultural production. The decrease in Cs137 going from the eastern to the western part of the island is accounted for by rainfall scavenging of atmospheric aerosols. (Bopp-ORNL)
W73-13423

FIXING CATION INTERACTION WITH BLISTER-LIKE OSMOTIC SWELLING ON VERMICULITE CLEAVAGES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-13425

DIETARY INTAKE OF COBALT BY THE ADULT POPULATION OF TARAPUR,
Tarapur Atomic Power Station (India).
I. S. Bhat.
Health Physics, Vol 24, p 553-554, May 1973. 3 tab, 9 ref.

Descriptors: *Cobalt radioisotopes, *Cobalt, *Nuclear wastes, *Food chains, Public helath, Asia, Soils, Vegetable crops, Foods, Diets, Trace elements, Path of pollutants, Water pollution sources.
Identifiers: *India (Tarapur).

Dietary intake of Co was determined as one of the elements whose radioisotopes may be released in effluents from nuclear powerplants. Intake by the Tarapur population is 65% from cereals, 22% from seafood, and the remainder from vegetables, meat, and milk. The average daily intake of 254 micrograms/day is comparable with that in the United States; however, in the United States 35% is from meat and milk, 35% from cereals, 12% from sea food, and the remainder from vegetables. The low Co content of the volcanic soils of Japan results in a 10-fold lower content in vegetables as compared with Tarapur and the United States, where the content of vegetables is comparable. (Bopp-ORNL)
W73-13426

ON THE WIND-DRIVEN CIRCULATION OF A STRATIFIED OCEAN,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
J. A. Johnson.
Journal of Marine Research, Vol 29, No 3, p 197-213, 1971. 5 fig, 10 ref.

Descriptors: *Ocean circulation, *Theoretical analysis, *Thermal stratification, *Mathematical models, *Winds, Oceanography, Hydrography, Temperature, Velocity, Model studies, Solar radiation, Wind velocity.

Various similarity solutions have been used to represent the depth variation in temperature and velocity fields of the theory of circulation in the thermal layer of the ocean. The main limitation to these solutions concerns the choice of boundary conditions at the surface when there is an applied wind stress and heat input. The ocean has been divided into an Ekman layer, a thermal layer and an almost isothermal abyssal layer. Theoretical consideration is given to the conditions under which the driving of circulation by wind-stress is important, and the Ekman-layer suction is matched to the vertical velocity in the thermal layer. The results for an applied zonal wind stress are given. Comparison of the calculated temperature field with observed temperature distributions is satisfactory. Upwelling may still be necessary in coastal boundary layers even when there is no component of wind stress parallel to the coast and hence no Ekman-layer flux away from the coast. Horizontal advection was found to be more important than horizontal diffusion of heat in determining the surface temperature distribution. (Jerome - Vanderbilt)
W73-13429

CONVECTIVE INSTABILITY IN LIQUID POOLS HEATED FROM BELOW,
Washington Univ., Seattle. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 08B.
W73-13442

THERMALLY-DRIVEN LINEAR VORTEX,
Florida State Univ., Tallahassee. Dept. of Mathematics.
For primary bibliographic entry see Field 08B.
W73-13443

DYNAMIC COOLING.

Technology Review, Vol 73, No 7, p. 54-55, May 1971. 2 fig.

Descriptors: *Ohio River, *Thermal pollution, *Forecasting, *Computer programs, Water quality, Water quality control, Model studies, Mathematical models, Cooling, Rivers, Data processing, Computer programs, Computer models, Electric power production, Thermal power plants, Hydrothermal studies, Heat transfer, Heat balance.
Identifiers: COLHEAT-studies.

The COLHEAT computer program, developed by the Pacific Northwest Laboratories of Battelle Memorial Institute, is a method of determining the cooling capacity of a river, based upon a multiplicity of parameters. In application to the streams of the Ohio River Basin, this program predicted that thermal loads will exceed cooling capacity by some time between 1984 and 1990. The standard upon which this program was based was that quantity of heat which could be assimilated by any stream and then dissipated to the atmosphere within a stream envelope of 5 F above background. Since the cooling capacity of the streams varies significantly depending on the season, the COLHEAT program shows that power demand will exceed cooling capacity during the summer in the Allegheny River watershed by 1980. Similar conditions exist in other areas. In such cases present cooling capacity must be supplemented with cooling towers and ponds. (Jerome-Vanderbilt)
W73-13449

MEASURING THERMAL PLUMES IN THREE DIMENSIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
L. L. Simmons, and J. A. Nutant.
Power Engineering, Vol 75, No 10, p. 44-45, October 1971. 2 fig.

Descriptors: *Thermal pollution, *Temperature, *Jets, Distribution patterns, Sampling, Monitoring, Thermometers, Heated water, Thermal powerplants, Water quality, Mixing, Density.
Identifiers: *Thermal plumes, Sensors, Thermistors.

Determining the three-dimensional distribution of waste heat in a thermal plume can be done by either a portable or a fixed system. With either, temperatures must be recorded as functions of surface dimensions, depth and time. The fixed system must be positioned carefully in the study area to assure that it actually does measure the desired water parameters. Data are recorded for retrieval or telemetered into a central receiver. Portable systems can use either remote or in-situ sensing. Remote sensing relies on infrared radiation detection through overflights or from land-based scanning units. In-situ sensing may be done with temperature-dependent resistance elements called thermistors. These thermistors can be placed at pre-determined levels on an electro-mechanical cable which is lowered from a boat at desired locations. (Oleszkiewicz-Vanderbilt)
W73-13450

SPECTRA OF THE TEMPERATURE AND HUMIDITY FLUCTUATIONS IN THE MARINE BOUNDARY LAYER,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia).
For primary bibliographic entry see Field 07B.
W73-13455

SIMPLIFIED METHOD FOR DETERMINING TOWER DRIFT RATE,
K. Juris.
Industrial Water Engineering, p. 30-31, April/May 1972. 2 fig.

Descriptors: *Cooling towers, *Mathematical models, *Evaporation, *Dissolved solids, Water cooling, Design, Condensation, Water loss, Model studies, Computer models, Flow rates.
Identifiers: *Spray ponds, Drift rates, Cooling ponds.

A simplified method is presented which only requires the measurement of the dissolved solids concentration of make–up water and recirculated hot water to determine drift rates from mechanical and natural draft cooling towers and spray ponds. The circulating, evaporation, drift, make-up and blowdown water flows constitute the flow of water through a closed cycle cooling system. When blowdown flow is shut off, the concentration of dissolved solids in the recirculating water increases until a constant value is reached when the rate of dissolved solids escaping in the drift of the tower equals the rate of dissolved solids entering in the form of make-up flow. The rate of concentration of dissolved solids in the circulating and make-up water is indirectly related to the drift rate. A high ratio indicates a low drift rate and a low ratio indicates a high drift rate. An example of this relationship is presented. Since a high ratio may present some problems it is advised to perform the experiments when the dissolved solid content of the make-up water is low and in the winter when the evaporation rate would be less. A computer program of the situation could be developed using the usual cooling tower design parameters and the climatological parameters of dew point, dry bulb and source water temperatures as input data. (Jerome-Vanderbilt)
W73-13457

EFFECT OF NONCONDENSABLES IN SEA WATER EVAPORATORS,
Burns and Roe Construction Corp., Chula Vista, Calif.
For primary bibliographic entry see Field 03E.
W73-13463

NOMOGRAMS SIMPLIFY DESIGN OF STEAM CONDENSERS,
For primary bibliographic entry see Field 08C.
W73-13464

PROBLEMS WITH EXCHANGERS IN ETHYLENE PLANTS,
Schmidtsche Heissdampf G.m.b.H., Kassel (West Germany).
For primary bibliographic entry see Field 08G.

W73-13465

WARM WATER ADVECTION IN THE SOUTHERN BEAUFORT SEA AUGUST-SEPTEMBER 1971,
Coast Guard Washington, D.C. Oceanographic Unit.
For primary bibliographic entry see Field 02E.
W73-13466

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN FLOW,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 05G.
W73-13469

WATER POLLUTION AND ASSOCIATED EFFECTS FROM STREET SALTING,
Edison Water Quality Research Lab., N. J.
R. Field, E. J. Struzeski, Jr., H. E. Masters, and A. N. Tafuri.
Copy available from GPO Sup Doc as EP1.23/2:73-257, $0.85; microfiche from NTIS as PB-222 795, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-257, May 1973. 48 p, 28 fig, 11 tab, 109 ref.

Descriptors: Environmental effects, *Highway icing, Groundwater, Corrosion, Water pollution effects, Runoff, *Snow removal, Water supply, *Deicers, *Melting, Heating.
Identifiers: *Hydrophobic substances, *Salt storage, Stormwater runoff.

A state-of-the-art review is presented of highway deicing practices and associated environmental effects. The bare pavement policy has resulted in a great increase in the use of deicing salts. They are more efficient and economical than abrasives. However, there is excessive application leading to environmental problems. Besides chemical melting, various methods for deicing exist. Some of these are stationary and mobile thermal melting units, alternate deicing compounds, snow adhesion reducing pavements, electromagnetic energy for ice shattering, and drainage systems designed to capture snowmelt for treatment or control. Salt storage facilities often become a major contributing source of local groundwater and surface water salt contamination. Coverage of salt piles is becoming more prevalent. Types of enclosed structures are illustrated, and cost considerations given. High chloride concentration levels have been found in roadway runoff. The special additives in deicing salts may create more severe pollutional problems than the chloride salts. Serious groundwater contamination has occurred in many locations, for example, Maine, Massachusetts, New Hampshire, and Michigan. Widespread damage of roadside soils and vegetation has been observed in areas of liberal salt usage. (EPA)
W73-13471

ON PROPERTIES OF SEAWATER DEFINED BY TEMPERATURE, SALINITY AND PRESSURE,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02K.
W73-13477

THE USE OF WATER QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THERMAL EFFECTS PROBLEM,
RAND Corp., Santa Monica, Calif.
E. C. Gritton, J. Kvitky, and J. J. Leendertse.
Paper presented at American Nuclear Society Eighteenth Annual Meeting, June 18-22, 1972. Las Vegas, Nevada. 5 p, 7 ref.

Descriptors: *Model studies, *Estuaries, *Thermal pollution, *Temperature, Water quality, Water quality control, Mathematical models, Simulation analysis, Coasts, Finite element analysis, Density, Salinity, Heat balance, Hydrologic equation, Mixing, Surface waters, Data collections, Date processing.

A water-quality simulation model for well mixed estuaries and coastal seas has been developed. It is based on the numerical solution, by finite difference techniques of the two-dimensional vertically integrated equations of motion and continuity for fluid. Recently, a heat transport model has been incorporated into this simulation model to make it useful in analyzing thermal effect problems. Heat is regarded as a dissolved constituent, and the practical heat equation is identical to the mass transport equation. The arrangement of the equation enables one to fully account for temperature-dependent processes such as reaeration, coliform die-away, dissolved oxygen, biochemical oxygen demand, reaction coefficient, and dissolved oxygen saturation concentration by making reaction rates temperature dependent. The external sources or sinks of thermal energy into the waters of a bay or estuary are mainly through surface heat exchange processes and large thermal discharges from power plants. These sources can be accounted for in the model. The model is now being used in studies of Jamaica Bay, Long Island, New York, and Tampa Bay, Florida. (Jerome - Vanderbilt)
W73-13479

MAPS SHOWING AREAS IN THE SAN FRANCISCO BAY REGION WHERE NITRATE, BORON, AND DISSOLVED SOLIDS IN GROUND WATER MAY INFLUENCE LOCAL OR REGIONAL DEVELOPMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-13520

EFFECTS OF HIGHWAY DE-ICING SALTS ON GROUNDWATER AND WATER SUPPLIES IN MASSACHUSETTS,
Geological Survey, Boston, Mass.
S. J. Pollock, and L. G. Toler.
Highway Research Record, No 425, p 17-22, 1973. 3 fig, 3 ref.

Descriptors: *Deicers, *Water pollution sources, *Massachusetts, *Salinity, Path of pollutants, Chlorides, Groundwater, Observation wells, Monitoring, Snow removal.
Identifiers: *Road salting.

The concentration of chloride in some public water supplies has increased significantly during the last few years. This increase corresponds to the increased use of salts for de-icing highways. In some localities, the concentration of chloride has increased beyond the 250 mg per liter recommended by the U.S. Public Health Service as an upper limit for drinking water supplies. In 1965, a program was begun to monitor the concentration of chloride in groundwater along state highways in Massachusetts. Initially, 10 sites were selected to represent various types of geologic materials along old and new highways. At most sites, two wells were installed, one at 15 ft and one at 30 ft from the highway. At one site, 12 wells were installed at several depths and distances for the highway. All wells were on the downgrade side of the highway with respect to the water table. Samples were collected from each well periodically and analyzed for chloride. The concentration of chloride in normal, uncontaminated groundwater in eastern Massachusetts is about 5 to 15 mg per liter. Chloride concentration in the aquifers at the test sites near highways and analyses of water from wells near heavily salted highways and salt storage sites indicate that a significant part of the salt applied to roadways is entering the groundwater system (Knapp-USGS)
W73-13525

EFFECTS OF PHOSPHORUS APPLICATION RATE, SOIL PROPERTIES, AND LEACHING MODE ON P-32 MOVEMENT IN SOIL COLUMNS,
Ohio State Univ., Columbus.
T. J. Logan, and E. O. McLean.
Soil Science Society of America Proceedings, Vol 37, No 3, p 371-374, May-June 1973. 2 fig, 2 tab, 13 ref.

Descriptors: *Leaching, *Phosphates, *Water pollution sources, *Fertilizers, Path of pollutants, Adsorption, Solubility, Nutrients, Nutrient removal.
Identifiers: *Phosphorus fixation.

Movement of monocalcium phosphate labeled with P-32 was investigated in column experiments with application rate, fixation capacity, and mode and intensity of leaching as variables. Three soils of contrasting texture and fixation capacity were studied. Leaching of P increased with application rate and intensity of leaching. Constant head leaching resulted in greater movement of P-32 out of the surface layer and greater accumulation in the leachate than intermittent leaching. In general, P 32 recovered in the leachate was nonionic except in instances where maximum leaching occurred. Significant amounts of P-32 were recovered in the leachate only with sandy loam soil and at the highest application rate. (Knapp-USGS)
W73-13553

HYDRAULIC SAND-MODEL STUDY OF THE CYCLIC FLOW OF SALT WATER IN A COASTAL AQUIFER,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 02L.
W73-13558

BEHAVIOR OF DETERGENTS (ABS), BACTERIA, AND DISSOLVED SOLIDS IN WATER-SATURATED SOILS,
Geological Survey, Denver, Colo.
H. G. Page, C. H. Wayman, and J. B. Robertson.
Geological Survey Professional Paper 450-E, p E179-E181, 1962. 2 fig, 1 tab, 7 ref.

Descriptors: Filtration, *Detergents, E. Coli, *Surfactants, Bacteria, Clogging, *Soil filters, Tracers, *Sewage effluents, *Alkylbenzene sulfonates, Treatment, Permeability, Porosity, Water pollution control.
Identifiers: Methylene-blue, Agar, Colloidal alumina.

The comparative effectiveness of a coarse-grained, a fine-grained, and a colloid-coated soil in removing ABS, dissolved solids, and bacteria from sewage effluent was determined under saturated-flow conditions. Coarse sand and sandy loam removed about 90 percent of the bacteria from sewage within a few feet of travel, but additional travel did not remove all the remaining bacteria. Dissolved solids and detergent (ABS) content virtually were unaffected by filtration of saturated flow. Because bacterial clogging occurred quickly in fine-grained soils, coarser sand was preferred as a pollution filter for the removal of bacteria. (Campbell-NWWA)
W73-13560

GROUND-WATER CONTAMINATION AND LEGAL CONTROLS IN MICHIGAN,
M. Deutsch.
Geological Survey Water Supply Paper 1691, 79 p. 23 fig.

Descriptors: *Michigan, *Groundwater resources, Legal aspects, *Pollution abatement, Freshwater, Water wells, Well regulations, Saline water encroachment, Industrial wastes.
Identifiers: *Groundwater contamination, Hydrologic studies, Regional surveys.

The great importance of the fresh ground-water resources of Michigan is evident because 90 percent of the rural and about 70 percent of the total population of the State exclusive of the Detroit metropolitan area are supplied from underground sources. Manmade and natural contaminants, including many types of chemical and organic matter, have entered many of the numerous aquifers of the State. Industrial and domestic wastes, septic tanks, leaking sewers, flood waters or other poor quality surface waters, mine waters, solids stored or spread at the surface, and even airborne wastes all have been sources of ground water contamination in Michigan. In addition, naturally occurring saline waters have been induced into other aquifers by overpumping or unrestricted flow from artesian wells, possibly by dewatering operations, and by the deepening of surface stream channels. Vertical migration of saline waters through open holes from formations underlying various important aquifers also has spoiled some of the fresh ground waters in the State. In spite of the contamination that has occurred, however, the total amount of ground water that has been spoiled is only a small part of the total resource. Overall legal authority to control most types of ground-water contamination in the State has been assigned by the Michigan Legislature to the Water Resources Commission, although the Department of Conservation and the Health Department also exercise important water-pollution control functions. (Campbell-NWWA)
W73-13562

EFFECT OF THE RATE OF APPLICATION AND THE VOLUME OF APPLIED WATER ON THE RATE OF MOBILITY OF CERTAIN INSECTICIDES IN CLAY SOIL,
Ain Shams Univ., Cairo (Egypt). Faculty of Agriculture.
M. S. El-Rafie, and Z. H. Zidan.
Bull Entomol Soc Egypt Econ Ser. 5. p 85-94. 1971.
Identifiers: *Clay soils, Heptachlor, *Insecticides, Mobility, Residues, Sand, Soils, Temik, Water pollution sources, *Path of pollutants.

The effect of 3 successive doses and 3 volumes of applied water on the rate of mobility of heptachlor, Di-Syston and Temik was studied in 2 types of soil (i.e., sand and clay soil), under laboratory conditions, in individual glass tubes. Residues were chemically analyzed in 5 separated layers of each experimental tube and in the leach. The effects on the rates of binding within the top layer, the rates of distribution within the 2nd to the 5th layers and the rates of leach were taken as a criterion.--Copyright 1973, Biological Abstracts, Inc.
W73-13579

DESTRUCTION OF ORGANIC SUBSTANCE IN OOZE DEPOSITS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. I. Romanenko, and S. I. Kuznetsov.
Mikrobiologiya. Vol 41, No 2, p 356-361. 1972. Illus. English summary.
Identifiers: *Ooze deposits, *Organic destruction, Reservoirs, Substances, *Sediment deposition, Aerobic conditions.

The analysis of the circulation of organic substance in water reservoirs requires the determination of the degree of destruction of organic substances sedimented from water into ooze deposits. The method of determination of aerobic and anaerobic decomposition of organic substances are described and the results of determinations of bottom deposits in the Rybinsk reservoir are presented. During the vegetative period of 1968, 111 mg C m2/day of organic substance was decomposed by aerobic processes and in 1969, 205 mg C m2/day. Individual determinations showed that 40% of the total mineralized organic substance/day was decomposed under anaerobic conditions.--Copyright 1973, Biological Abstracts, Inc.
W73-13584

RADIOACTIVE FALLOUT IN RAIN AT MELBOURNE, 1958 THROUGH 1970,
Commonwealth Scientific and Industrial Research Organization, Appendale (Australia). Div. of Atmospheric Physics.
B. B. Hicks.
Tellus. Vol 24, No 3, p 277-281. 1972. Illus.
Identifiers: *Australia (Melbourne), *Radioactive fallout, *Rain, Measurements.

Gross beta-activity measurements were analyzed from the point of view of the annual cycle in the lower troposphere. The annual cycles found in rainfall concentration of radioactive fallout and in the total fallout deposition peak at different times; the former in Dec. and the latter in Aug. The difference was explained in terms of the variation in rainfall. A phase difference was apparent between cycles and in situ stratospheric data, suggesting that ground level air lags behind the stratophere by about 1 or 2 mo.--Copyright 1973, Biological Abstracts, Inc.
W73-13585

LOADING THE RHINE WITH ORGANIC POLLUTANTS, (IN GERMAN),
Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Radiochemie.
W. Koelle, H. Ruf, and L. Stieglitz.
Naturwissenschaften, Vol 59, No 7, p 299-305. 1972. Illus. English summary.
Identifiers: Carbon, Chlorine, DDE, Fish, *Germany (Rhine River), Mercury, Organic loading, Pollutants, Pesticides.

The organic pollution of the Rhine is discussed using overall analyses like total organic C, organic Cl and radiocarbon dating. Fish of Lake Constance and the Rhine were analyzed for unpolar petrochemicals and Hg. They showed an increasing enrichment of hydrocarbons, chlorinated benzenes, chlorinated biphenyls and DDE along the flow of the Rhine. The maximum content of organic Cl in the fat was 340 ppm and of Hg in muscle tissue, 1.32 ppm.--Copyright 1973, Biological Abstracts, Inc.
W73-13587

THE OCCURRENCE AND DISTRIBUTION OF MERCURY IN THE SEDIMENTS OF PETIT LAC (WESTERN LAKE GENEVA),
Geneva Univ. (Switerzerland). Dept. of Geology.
J-P., Vernet, and R. L. Thomas.
Eclogae Geol Helv. Vol 65, No 2, p 307-316. 1972. Illus.
Identifiers: Contamination, Distribtution patterns, Industrial wastes, Lakes, *Mercury, Petit Lac, *Sediments, Switerzerland (Lake Geneva), *Lake sediments.

Hg analyses of surface sediments from the Petit Lac (western Lake Geneva) gave values ranging from 24-1274 ppb with a mean of 622 ppb representing an increase in concentration at least 3 times above natural levels. The contaminant Hg to Lake Geneva is derived from industrial sources in the upper Rhone River draining into the eastern part of the lake (Grand Lac) with subsequent transportation in association with fine sediments particles to the Petit Lac. In the Petit Lac the Hg enriched sediment is dispersed by current activity with sedimentation occurring predominantly in 3 deeper water sub-basins. From correlation analysis the Hg is adsorbed by amorphous, hydrated iron oxides with complexed phosphorus which occurs as a coating on individual clay mineral particles.--Copyright 1973, Biological Abstracts, Inc.
W73-13588

LEVELS OF MERCURY IN THE SEDIMENTS OF SOME SWISS LAKES, INCLUDING LAKE GENEVA AND THE RHONE RIVER,
Geneva Univ (Switzerland) Dept of Geology
J-P Vernet and R. L. Thomas
Eclogae Geol Helv Vol 65, No 2, p 293-306, 1972 Illus
Identifiers *Lake Geneva, Lakes *Mercury, *Rhone river, Sediments, *Switzerland

Sediment samples taken from Lakes Bienne, Brienz, Joux, Tuma, Saoseo, Bodan and Geneva were analyzed for total Hg Other than Lake Brienz all of the lakes show some evidence of Hg contamination from atmospheric or industrial/municipal sources with levels of Hg above the accepted background level of 200 ppb The most southeasterly lakes, Tuma and Saoseo, show the effect of the precipitation of atmospheric Hg derived from the industrial complexes of Northern Italy. Higher levels are observed in Lake Saoseo than in Lake Tuma due to its geographic location relative to prevailing westerly and southwesterly winds. Sediment Hg concentration profiles in the Rhone River identify 3 canal systems, X, Y and Z and the La Drance tributary as the sources of industrial Hg contamination of the Rhone River and Lake Geneva. Repetitive sampling from 1964-1971 suggests that significant industrial input to the Rhone River commenced between 1965 and 1967 and has increased annually to 1971.--Copyright 1973, Biological Abstracts, Inc.
W73-13617

COMPARISON OF POLLUTION DEGREE OF FLUVIAL WATERS EVALUATED BY MEANS OF THE BOD5 TEST AND A SAPROBIOLOGICAL METHOD,
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
S. Golowin.
Pol Arch Hydrobiol, Vol 18, No 4, p 381-391, 1971, Illus.
Identifiers: Biological studies, Biosestin, Effluents, *Fluvial waters, Method, Mill, Oxygen, Pollution, *Saprobiological method, Sugar, *Poland (Silesia), *BOD5, Biochemical oxygen demand.

Investigations of 3 rivers in Lower Silesia, Poland, helped establish correlations between saprobity of bioseston and biological O2 demand (BOD5) values. The correlations were different for each river, and for changing degrees of pollution they were different for the same river at different seasons. The correlations were almost identical for different rivers subject to identical or similar influences (2 rivers exposed to similarly purified sugar-mill effluents). Thus, saprobity was not an absolute and direct measure of the state of pollution of a river, but it was a measure of an individual reaction of biocenosis of a given river to pollution or its change. Saprobity did not hinder the comparison of 2 polluted rivers, or even the same river in different test seasons. A reaction of a set of saprobes to an increase of pollution depended on the degree of adaptation of the set to heavier concentrations of organic substances vulnerable to decomposition. The degrees of adaptation were expressed by a curve defining the relationship between saprobity and BOD5. A steep slope was an evidence of a better adaptation of biocenosis. A better adaptation was expressed by a strong increase in alpha-meso and polysaprobes related to small increases of BOD5 in comparison with a river with nonadapted biocenosis.--Copyright 1973, Biological Abstracts, Inc.
W73-13622

EXPERIMENTAL INFORMATION FOR SUBSTANTIATING THE MAXIMAL PERMISSIBLE CONCENTRATION OF ISOPROPYLBENZOL HYDROGEN PEROXIDE IN BODIES OF WATER (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
R. D. Smirnova, and L. F. Kos'mina.

Gig Sanit, Vol 36, No 12, p 17-19, 1971, English summary.
Identifiers: *Hydrogen peroxide, Maximal permissible concentration, *Organoleptic properties, Water pollution sources.

The threshold concentrations of isopropylbenzol hydrogen peroxide judged by its effect on the organoleptic properties of water, the general sanitary regimen, and its inefficient sanitary-toxicologic dose were determined by means of complex hygienic investigations. The smallest value of the 3 indices (0.025 mg/kg of 0.5 mg/l) is suggested as the maximum permissible concentration of isopropylbenzol in water bodies.--Copyright 1973, Biological Abstracts, Inc.
W73-13623

ON BACTERIAL AFTERGROWTH IN DRINKING AND INDUSTRIAL WATER: I. THE INFLUENCE OF ION-EXCHANGE PLANTS (IN GERMAN),
Hygiene-Institut, Frankfurt am Main (West Germany). Abteilung Hygiene.
For primary bibliographic entry see Field 05F.
W73-13629

SOLUBILITY OF MANGANESE IN THE PRESENCE OF SOIL CHEMICALS,
Rhode Island Univ., Kingston.
L. K. Wang.
M. S. Thesis, 1967. 110 p, 21 fig, 24 tab, 48 ref.

Descriptors: Groundwater, *Soils, Erosion, Sedimentation, *Manganese, Hydrogen Ion Concentration, Chemicals, Water pollution sources, *Solubility, *Organic acids, *Chelation.
Identifiers: Manganese monoxide, Manganese dioxide, Tartaric acid, Succinic acid, Citric acid, Acetic acid, Oxalic acid, Lactic acid, Organometallic complexes.

Organic acids, such as tartaric acid, succinic acid, citric acid, acetic acid, oxalic acid, and lactic acid, would form soluble complexes with the manganese monoxide and manganese dioxide and could therefore be partially responsbile for the solution and transport of manganese in ground water. The laboratory determinations demonstrated that these six organic acids are effective chelating agents capable of complexing with manganese. The relative ability of these organic acids to chelate with manganese to form a soluble product is in the following decreasing order: citric, acetic, oxalic, succinic, lactic, tartaric. The organometallic complexation of manganese is pH dependent. A decrease of pH will increase the level of soluble manganese in ground water. The temperature effect on the solubility of manganese was measurable, but not very significant. When microorganisms are present in ground water, biological activity also influences the solubility of manganese. Generally, biochemical reduction in anaerobic ground water causes reducing conditions which will release manganese to solution; however, biological oxidation may render dissolved manganese insoluble and cause precipitation.
W73-13645

5C. Effects of Pollution

STUDIES ON THE INTERACTIONS OF BACTERIA AND NEMATODES,
Auburn Univ., Ala. Dept. of Botany and Microbiology.
G. R. Wilt, M. M. Joshi, and J. Metcalf.
Available from the National Technical Information Service as PB-222 494, $4.25 in paper copy, $1.45 in microfiche. Alabama Water Resources Research Institute Bulletin 10, 1973. 89 p, 30 fig, 15 tab, 11 ref. OWRR A-016-ALA (3).

Descriptors: *Nematodes, *Bacteria, *Viruses, *Bacteriophage, *Pseudomonas, Predation, Migration patterns, Oxygen requirements, Invertebrates, Microorganisms.
Identifiers: Pelodera, Vibrio, Chromobacterium, Agarbacterium.

Interactions of microbes common to water resources were investigated. Nematodes were able to distinguish between food bacteria and non-food bacteria, and between bacteria and lake bottom mud. They preferentially migrated to and fed on a Vibrio species at various distances, temperatures, and pH values. Migration to food bacteria increased with an increase in bacterial concentration. Resting and dead bacteria did not attract nematodes. Nematodes migrated to food bacteria even when they had to move into areas having reduced oxygen tensions or under a barrier to reach bacteria. Nematodes were not attracted by carbon dioxide. They did migrate, however, to a dialysate from food bacteria. Nematode predation resulted in greater reductions in viable numbers of bacteria than total numbers of bacteria. Interactions between bacteria and bacteriophage occurred under a variety of temperature and pH values. The bacterium-phage interaction seemed to be more sensitive to extremes in temperature and pH values than either associate by itself. P. aeruginosa in the presence of its phage utilized oxygen at a greater rate than in the absence of phage. Nematodes were observed to disseminate bacteriophage over a surface seeded with host bacteria.
W73-13001

SULFUR BUDGET OF LAKE SHELBYVILLE, ILLINOIS, AND THE EFFECTS OF SULFIDES UPON CHAOBORUS,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 05B.
W73-13005

FACTORS CONTROLLING COPPER (II) CONCENTRATIONS IN THE KEWEENAW WATERWAY,
Michigan Technological Univ., Houghton. Dept. of Chemistry and Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-13010

THE EFFECTS OF ENRICHMENT ON LAKE SUPERIOR PERIPHYTON,
Wisconsin Univ., Eau Claire. Dept. of Allied Health.
R. R. Nelson, T. O. Odlaug, B. O. Krogstad, O. R. Ruschmeyer, and T. A. Olson.
Available from the National Technical Information Service as PB-222 498, $5.25 in paper copy, $1.45 in microfiche. University of Minnesota, Water Resources Research Center, Minneapolis Bulletin 59, May 1973. 182 p, 60 fig, 19 tab, 219 ref. OWRR B-020-MINN (3). 14-31-0001-3095.

Descriptors: *Periphyton, *Nutrients, *Lake Superior, Productivity, *Minnesota, Algae, *Phosphates, *Nitrates, Water pollution effects.
Identifiers: Complete nutrient media, Control pools, Test pools.

Two natural rock basins were constructed at the lakeside along the north shore at Castle Danger, Minnesota for the purpose of exposing naturally grown and regrowth periphyton to higher-than-normal levels of phosphate and nitrate. At weekly intervals during 1969 and 1970, samples were collected and productivity was measured by enumeration of organisms, chlorophyll analysis, and weight (dry and organic). Lake Superior periphyton responds dramatically to increased additions of phosphorus and nitrogen. If the nearshore area of Lake Superior ever received nutrients, such as those added to the experimental test pool at Castle Danger, a drastic change in the Lake's biota could occur. For example, as enrichment increased, the predominant clean-water diatom forms could eventually be replaced by the more tolerant green or blue-green algae. In addition, the very composition of the macrobenthic forms found in Lake Superior could be altered as a result of their dependence on the periphyton, which, as primary producers, from the first link in the food chain. Likewise, certain fish which depend on benthic organisms for their food may be adversely affected as an indirect result of a changing periphyton community. (Walton-Minnesota)
W73-13011

THERMAL EFFECTS ON EGGS, LARVAE AND JUNVENILES OF BLUEGILL SUNFISH,
Aquatic Sciences, Inc., Boca Raton, Fla.
Arnold Banner, and Joel A. Van Arman.
Copy available from GPO Sup Doc as EP1.23:73-041, $2.10; microfiche from NTIS as PB-222 625, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-041, May 1973. 111 p, 2 fig, 7 tab, 88 ref. EPA Contract No 14-12-913, Project No. 18050GAB.

Descriptors: *Thermal stress, *Sunfishes, *Water temperature, Fish reproduction, Fish eggs, Larvae, Growth stages, Fish juveniles, Temperature control, Fish management, Fishkill, Spawning, Aquatic environment, Water pollution effects, Thermal pollution, Bioassay.
Identifiers: *Bluegill sunfish, Fish spawning induction.

Bioassay experiments were conducted to determine thermal tolerance of early life history stages of bluegill sunfish. Bluegill eggs hatched at temperatures from 18 to 36C during two incubation tests. Maximal hatch occurred at 22.2 and 23.9C. Lower TL50 temperature for hatch of normal fry was 21.9C and upper TL50 temperature was 33.8C. Juvenile bluegills acclimated to 12.1C had a lower 96-hour TL50 of 3.2C and an upper 96-hour TL50 of 27.5C. Juveniles acclimated to 32.9C had a lower 96-hour TL50 of 15.3C and an upper 96-hr TL50 of 37.3C. TL50 increased with increasing temperature of acclimation. For juveniles acclimated to a given temperature, upper TL50 decreased with longer exposure. A preliminary test determined ranges of thermal tolerance for sac-fry and swim-up fry. In another prelinary test, juvenile bluegills were acclimated to 12.1, 19.0 26.0 or 32.9C, and reared at a series of test temperatures for three to six wks. to define optimal temperature ranges for growth and survival. Additional research determined conditions for the culture of Lepomis macrochirus, including spawning induction, hatching, and growth of larvae and juveniles. (EPA)
W73-13020

EFFECTS OF COPPER ON THE LOCOMOTOR ORIENTATION OF FISH,
Texas A and M Univ., College Station. Dept. of Biology.
H. Kleerekoper.
Copy available from GPO Sup Doc as EP1.23:73-045, $1.25; microfiche from NTIS as PB-222 596, $1.45. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-045, June 1973. 97 p, 18 fig, 10 tab, 54 ref. EPA Project 18050 DWQ. R800995.

Descriptors: Channel catfish, Suckers, Sunfishes, Bass, *Copper, Fish, Water temperature, Ions, Fish behavior, Water pollution effects, Gradients (Stream).
Identifiers: Goldfish, White sucker, Green sunfish, Lepomis cyanellus, Carassius auratus, Micropterus salmoides, *Fish locomotion, Avoidance behavior (Fish).

The effects of copper ions at subacute concentrations on the locomotore orientation of goldfish (Carassius auratus), channel catfish (Ictalurus

punctatus), largemouth bass (Micropterus salmoides), white sucker (Catostomus commersoni commersoni) and green sunfish (Lepomis cyanellus) were investigated in detail. In regions of water containing 11-17 micrograms/l Cu++ (as CuCl2) in a shallow gradient goldfish oriented toward the copper source ('attraction'). This response is reduced in a somewhat steeper gradient. In steep gradients significant but no absolute avoidance behavior occurred. Whether the response will be 'avoidance' or 'attraction' seems to depend on the slope of the gradient to which the fish is exposed. Even in steep gradients, the 'avoidance' behavior is reversed to 'attraction' when the copper ions interact with a temperature slightly higher (.4C) than that of the surrounding copper free water. The interaction creates a new stimulus configuration which is different from those formed by the two variables separately. The orientation of the largemouth bass is not affected by copper ions at the concentrations tested. Channel catfish are weakly attracted by the copper-containing water and green sunfish significantly increase time spent there. Suckers significantly but not absoletely 'avoid' such water through changes in turning behavior. (EPA)
W73-13021

INTERACTION BETWEEN MARINE ORGANISMS AND OIL POLLUTION,
Woods Hole Oceanographic Institution, Mass.
M. Blumer, J. M. Hunt, J. Atema, and L. Stein.
Copy available from GPO Sup Doc as EP1.23:73-042, $1.25; microfiche from NTIS as PB-222 628, $1.45. Environmental Protection Agency, Ecological Research Series EPA-R3-73-042, May 1973. 97 p, 18 fig, 5 tab, 11 ref. EPA Project 18080 EBN and 10850 EBN.

Descriptors: Behavior, *Oil wastes, Analytical techniques, Gas chromatography, *Degradation (Decomposition), *Path of pollutants, *Lobsters, *Organic compounds, *Oil pollution, Water pollution effects, Water pollution sources.

Part I of this project has established that fossil hydrocarbons can be distinguished from biogenic hydrocarbons in living organisms. Hydrocarbons are stable in marine organisms and sediments and can move unaltered through several trophic levels. Only very low levels of organic stimuli are necessary for chemical communication--a mechanism especially prone to interference by pollutants. Part II has established that a low level of crude oil (0.9 milliliters/liter) interferes with the timing of feeding behavior in the lobster (Homarus americanus). Water soluble fractions (in the 50 ppb range) did not affect feeding behavior. Added oil reduced the lipids as well as alkane and alkene-aromatic content of aquaria. Degradation of added oil followed the usual pathways of evaporation, dissolution, oxidation, polymerization, and metabolism. (EPA)
W73-13023

ACUTE EFFECTS OF ADMINISTRATION OF METHYL MERCURIC CHLORIDE ON TISSUES AND ENZYME ACTIVITY IN CHANNEL CATFISH (ICTALURUS PUNCTATUS),
Louisville Univ., Ky. Dept. of Anatomy.
M. W. Kendall.
PhD Dissertation, May 1972. 101 p, 39 fig, 2 tab, 35 ref. OWRR-A-038-KY (2).

Descriptors: *Mercury, *Catfishes, *Water pollution effects, *Pathology, *Toxicity, Public health, Fish management, Fish farming, Enzymes, Fish, Inhibitors.
Identifiers: *Methyl mercury, Fish physiology.

In Kentucky and neighboring southeastern states, the channel catfish is being extensively cultured as a food crop. Acute exposure to methyl mercuric chloride causes enzyme and tissue alterations. The principal reaction of absorbed mercury is to bind thiols, forming mercury mercaptide. The ultimate effect of mercury and its compounds is based upon its ability to inhibit enzymes. In the channel catfish, a single intraperitoneal injection of 15 mg/kg methyl mercuric chloride caused deposition of mercury in liver, kidney, skeletal muscle, and gill. Marked pathology was evidenced by necrosis in the liver, necrosis of pancreatic tissue within portal venous walls, necrosis of renal tubular cells and marked thickening of renal glomerular basement membrane. The principal effects on enzymes were facilitation of acid phosphatase, alkaline phosphatase, and leucine aminopeptidase and inhibition of succinic dehydrogenase and oxygen consumption. A lower dosage of 1.5 mg/kg methyl mercuric chloride produced no structural alterations but did produce changes in enzyme activity. These alterations in tissues and enzyme activity are indicative of acute methyl mercuric chloride intoxication in the channel catfish. (Knapp-USGS)
W73-13029

AQUATIC ORGANISMS AND HEAVY METALS IN MISSOURI'S NEW LEAD BELT,
Missouri Univ., Rolla.
N. L. Gale, B. G. Wixson, M. G. Hardie, and J. C. Jennett.
Water Resources Bulletin, Vol 9, No 4, p 673-688, August 1973. 6 fig, 6 tab, 11 ref.

Descriptors: *Lead, *Mining, *Mine wastes, *Food chains, *Water pollution effects, Path of pollutants, Algae, Aquatic animals, *Missouri, Fish, Snails, Crayfish, Heavy metals.
Identifiers: *New Lead Belt (Mo).

The New Lead Belt of southeastern Missouri has recently become the largest lead producing region of the world. Since the industrial development began, there have been a number of nuisance biological blooms in several of the small streams receiving effluent from the mines and mills. The major constituents of the problem algal growths include Cladophora, Oscillatoria, Mougeotia, Zygnema, Spirogyra, Cymbella, and a variety of other stalked and nonstalked diatoms. Secondary blooms of Sphaerotilus reach problem proportions in some streams, particularly in the autumn. Finely ground rock flour and mineral particles escaping from tailings dams are trapped by the stream vegetation. Concentrations of lead, zinc, copper, and manganese in the algal and bacterial mats are inversely related to distance downstream from the tailings dams. Consumer organisms, including crayfish, snails, aquatic insects, tadpoles, minnows and larger sunfish, were analyzed to determine the extent of dissemination and concentration of heavy metals through food chains. Insignificant concentrations of heavy metals were found in the consumer organisms studied, though in at least one problem stream the normal consumer organisms were markedly reduced in numbers. (Knapp-USGS)
W73-13037

EXTENSIVE OXYGEN DEPLETION IN MOBILE BAY, ALABAMA,
Alabama Marine Resources Lab., Dauphin Island.
E. B. May.
Limnology and Oceanography, Vol 18, No 3, p 353-366, May 1973. 5 fig, 1 tab, 33 ref.

Descriptors: *Estuaries, *Oxygen sag, *Water pollution effects, *Density stratification, *Alabama, Salinity, Dissolved oxygen, Anaerobic conditions, Biochemical oxygen demand, Eutrophication, Organic wastes, Waste assimilative capacity.
Identifiers: *Mobile Bay (Ala).

Extensive areas of bottom water in Mobile Bay, Alabama, suffer oxygen depletion in summer because of salinity stratification. When these water masses low in dissolved oxygen are occasionally forced against the beach, demersal fish and crustaceans migrate shoreward in a depressed or moribund state. In the absence of technical data, these occurrences, locally called jubilee provide over a century of historical evidence oxygen depletion. Oxygen depletion and jubile occurred in the bay before man physicall modified the basin, but the conditions responsib for oxygen depletion are now worse than in th past. Because of bathymetric changes and modi cations which have restricted water circulatio Mobile Bay has exceeded its capacity to assimilat its oxygen demand in summer. This has severel affected the biota of the estuary. (Knapp-USGS) W73-13065

AN AQUARIUM TEMPERATURE CONTRO SYSTEM FOR FIELD STATIONS,
New York Cooperative Fishery Unit, Ithaca.
H. A. Regier, and W. H. Swallow.
Progressive Fish Culturist, p 43-46. January, 196 2 fig, 1 tab, 2 ref. OWRR-A-013-NY (3).

Descriptors: *Temperature control, *Aquari *Fish handling facilities, Equipment, Researc facilities, Laboratories, Automatic control.

An automated and rugged system of temperatu controlled aquaria was set up to maintain a ten perature range within 0.5C. The system is capabl of maintaining constant temperature and pr grammed temperature changes. Methods, type an brand of equipment and precautions are given. (I win-Cornell)
W73-13079

EFFECTS OF INCUBATION TEMPERATUR ON SURVIVAL OF LARGEMOUTH BAS EGGS,
Cornell Univ., Ithaca, N.Y. Dept. of Conserva tion.
J. W. Kelley.
Progressive Fish Culturist, p 159-163. July, 1968, tab, 9 ref. OWRR-A-013-NY (6).

Descriptors: *Largemouth Bass, *Temperatur Thermal pollution, *Fish eggs, Incubation, Wate pollution effects, *Thermal stress.

Largemouth Bass eggs were taken from a natura environment and subjected to varying intensitie of temperature shock. Survival was highes between 55 and 75F, generally lower at 50 degree and 80 degrees, and lowest at 85F. The percentag of hatch of eggs acclimated to 50 degrees, 8 degrees and 85F was generally much higher tha the percentages for non-acclimated eggs incubate at those temperatures. (Irwin-Cornell)
W73-13080

FOOD OF LARGEMOUTH BASS (MICROP TERUS SALMOIDES) FROM A SOUTH CAROLINA RESERVOIR RECEIVING HEATE EFFLUENT,
Virginia Cooperative Fishery Unit, Blacksburg.
D. H. Bennett, and J. W. Gibbons.
Trans Am Fish Soc. Vol 101, No 4, p 650-654 1972. Illus.
Identifiers: Bass, Effluents, Heated water, *Lar gemouth bass, Lepomis-Sp, Micropterus-Sal moides, Reservoirs, *South Carolina, *Therma pollution.

Largemouth bass (Micropterus salmoides) col lected from an area of a South Carolina reservoi at ambient temperatures contained greate amounts of food than bass taken at the entrance o a heated effluent in the same reservoir. Unidentifi able fish occurred in the highest frequency at both areas; sunfish (Lepomis sp.) had the highes frequency of occurrence of all identifiable items All major dietary components were found i stomachs of bass from both areas from March through May although the relative occurrences o these items varies in the winter, spring, and fall Increased metabolic requirements on fish living i the heated portion of the reservoir, are possibly

educed by individuals entering the waters at ex-
eme temperatures to feed, followed by move-
ent to deeper, stratified waters at lower tempera-
res.--Copyright 1973, Biological Abstracts, Inc.
73-13083

LIME PRODUCTION BY PSEUDOMONAS ERUGINOSA. II. A NEW SYNTHETIC MEDI-M AND CULTURAL CONDITIONS SUITABLE OR SLIME PRODUCTION BY PSEU-OMONAS AERGINOSA,
oho Univ., Tokyo (Japan). School of Medicine.
. Goto, T. Murakawa, and S. Kuwahara.
panese Journal of Microbiology, Vol 17, No 1, p
5-51, January 1973. 8 fig, 2 tab, 13 ref.

escriptors: *Nutrient requirements, *Growth
tes, *Slime, Cultures, Pseudomonas, Pathogenic
cteria, Viscosity.
lentifiers: *Pseudomonas aeruginosa, Culture
edia.

sing Pseudomonas aeruginosa culture IFO 3445,
e nutritional requirements and cultural condi-
ons suitable for slime production were in-
estigated. A synthetic medium was established
om the experimental results, which was com-
osed of sodium glutamate, glucose, phosphate
nd magnesium salt. When a cellophane plate
ethod was used, incubation at 37C for 3 days
roduced the highest relative viscosity. In the
resence of an oxidizable carbohydrate the rela-
ve viscosity of the cul.ture fluid was reduced
ith the acid reaction, and recovered if the reac-
on was adjusted to pH 7-8. (Little-Battelle)
73-13088

HE VERTICAL DISTRIBUTION OF SOME ILIATED PROTOZOA IN THE PLANKTON F A EUTROPHIC POND DURING SUMMER TRATIFICATION,
urham Univ. (England). Dept. of Botany.
. Goulder.
reshwater Biol. Vol 2, No 2, p 163-176. 1972. Il-
s.
dentifiers: *Ciliated protozoa, Distribution pat-
rns, England, *Eutrophic pounds, Loxodes-
agnus, Loxodes-striatus, Photosynthesis,
hytoplankton, Ponds, Protozoa, Stratification,
ummer, *Vertical distribution.

he vertical distribution of some ciliated Protozoa
the plankton of a pond in northwest England
as investigated during Aug. 1971. At this time,
hen the pond was stratified with an O2 deficient
ypolimnion, ciliates were counted at 10-cm depth
tervals every 5 hr over 25 hr. The most common
pecies (Loxodes magnus and L. striatus) were
onfined to the hypolimnion; there was no diurnal
igration into the epilimnion. Earlier work had
hown that Loxodes species required O2; it is
herefore possible that these ciliates, which in-
abited the O2 deficient hypolimnion, migrated
ertically, from time to time, to an O2 supply at
e boundary with the well-oxygenated epilimnion.
o test this, Loxodes populations were confined in
ellophane tubes both in the hypolimnion (at 3 m)
nd epilimnion (0.5 m) for 12 and 24 hr (earlier tri-
ls had shown that the tubes were not markedly
oxic). The ciliates died at both depths, and in a
urther experiment when Loxodes were confined
t 3 m and 0.5 m and sampled at 5-hr intervals up to
5 hr it was found that they survived longer in the
ypolimnion. It is suggested that ciliates confined
t 3 m died because they were unable to migrate
ertically to an O2 supply, while those at 0.5 m
ied because some other adverse factor was
perating in the epilimnion. Laboratory experi-
ents showed that Loxodes died in water in which
hytoplankton photosynthesis took place and it is
uggested that side effects of photosynthesis in the
pilimnion (e.g., a rise in pH) caused the death of
iliates exposed at 0.5 m.--Copyright 1973, Biologi-
al Abstracts, Inc.
V73-13101

ECOLOGICAL OBSERVATIONS ON THE EMERGENCE OF CERCARIAE FROM GONIOBASIS FLORIDENSIS REEVE FROM THE WEKIVA RIVER, FLA.,
Santa Fe Junior Coll., Gainesville, Fla.
G. W. Hunter, III, and E. E. Wigington.
Ecology. Vol 53, No 5, p 901-907. 1972. Illus.
Identifiers: *Cercariae, Ecological studies, *Florida (Wekiwa River), Goniobasis-floridensis, Rivers.

An 18 mo. study of the infection of G. floridensis from the Wekiva River in south-central Florida revealed that overall infection peaks appear to occur in Dec. and then again in the spring (Feb.-May). A total of 3149 specimens of G. floridensis were examined for emerging cercariae with an overall prevalence rate of 5.1%; 9% of 789 snails from station 1 and 3.8% of 2369 snails from station 2 were positive. At station 1 xiphidiocercariae were present in all 6 of the collections, strigeids in 5, pleurolophocercous in 4, and cysticercariae in 2. At station 2 the pleurolophocercous cercariae occurred in 9 collections, xiphidio in 8, strigeid in 7, and echinostome and cysticercariae in 1 each. When totals are considered, xiphidiocercariae were the most abundant, occurring in 14 collections compared with the pleurolophocercous in 13, strigeids in 12, cysticercariae in 1. Multiple infections occurred only twice: 1 snail shed 2 species of xiphidiocercariae and the other, xiphidiocercariae and pleurolophocercous cercariae. Such items as pH, dissolved O2, temperature of the water, and so forth showed no particular correlation with the overall cercarial shedding pattern.--Copyright 1973, Biological Abstracts, Inc.
W73-13103

PESTICIDES, POLLUTION, AND FOOD SUPPLY,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
For primary bibliographic entry see Field 05G.
W73-13104

COMPETITION FOR UREA AMONG ESTUARINE MICROORGANISMS,
Woods Hole Oceanographic Institution, Mass.
C. C. Remsen, E. J. Carpenter, and B. W. Schroeder.
Ecology. Vol 53, No 5, p 921-926. 1972. Illus.
Identifiers: Asterionella, Bacteria, Chaetoceros, Chlorophyll, *Estuarine microorganisms, Pollution, Rhizosolenia, Salinity, Thalassiosira, *Urea decomposition, Phytoplankton, *Georgia.

Phytoplankton were responsible for the major part of the urea decomposition in the Savannah-Wilmington-Ogeechee estuaries and adjacent coastal waters in Georgia. This is an exception to the general rule that bacteria are favored over algae in the competition for dissolved organic compounds. Filtration of estuary water through a 20 micro mesh filter did not significantly change the concentration of urea-decomposing bacteria; there was, however, a significant change in phytoplankton cell concentrations, chlorophyll a, and urea decomposition rates. Thus, any differences in the decomposition of urea in filtered and unfiltered aliquots could be attributed to the phytoplankters removed by filtration. Average cell concentrations and chlorophyll a removed by filtration were 15% and 39% of the totals, respectively. The removal of urea-composing activity averaged 53% of the total. This indicates that the phytoplankters removed by filtration, mainly diatoms with large cross-sectional areas such as Rhizosolenia, Chaetoceros, Asterionella, Thalassiosira, etc., were responsible for proportionally higher amounts of urea decomposition than would be indicated on a purely cell-numbers basis. Urea concentrations ranged from 0.6 to 8.9 micrometer, with the highest values (average 3.41 micrometer) being found in the more polluted Savannah estuary. Lower values, generally 1-2 micrometer, were observed in the Wilmington and Ogeechee estuaries. Fresh water generally had slower urea decomposition rates (average of 6.2 micrometermoles liter-1 hr-1) than brackish waters (average 19.6 micrometermoles liter-1 hr-1). Turnover time for urea, calculated from these average values, was 25 days for fresh water and 4 days for brackish water.--Copyright 1973, Biological Abstracts, Inc.
W73-13108

THE CONTROL OF PH AND TOTAL ALKALINITY OR TOTAL CARBONATE IN AQUATIC BIOASSAYS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. F. Roberts, and H. E. Allen.
Trans Am Fish Soc. Vol 101, No 4, p 753-756. 1972. Illus.
Identifiers: *Alkalinity, *Bioassays, *Carbonates, Metals, Toxicity, Water pollution, Hydrogen ion concentration.

Basic chemical equilibrium concepts are employed to develop a method for precise control of pH and total alkalinity or total carbonate for use in bioassay studies. By precision control of these variables along with control of other variables, e.g., temperatue, hardness, dissolved O2, and dissolved organics, determination of the quantitative effects of these variables on the toxicity of heavy metals is possible.--Copyright 1973, Biological Abstracts, Inc.
W73-13111

EPIDEMIOLOGICAL STUDY ON CLONORCHIS SINENSIS AROUND LAKE BIWA, SHIGA PREFECTURE: II. SURVEY ON METACERCARIA INFECTION IN FRESH-WATER FISHES AND ON HUMAN INFECTION WITH THIS PARASITE, (IN JAPANESE),
Kyoto Prefectural Univ. of Medicine (Japan). Dept. of Medical Zoology.
M. Nagahana, Y. Yoshida, K. Matsuo, K. Kondo, and K. Matsuno.
Jap J Parasitol. Vol 20, No 6, p 499-506. 1971. Illus. English summary.
Identifiers: Acheilognathus-lanceolata, Acheilognathus-rhombea, Biwia-zezera, *Clonorchis-sinensis, Epidemiological, Fishes, Gnathopogon-elongatus-caerulescens, Gnathopogon-elongatus-elongatus, Human, Infection, *Japan (Lake Biwa), Lakes, *Metacercaria, Parasites, Pseudorasbora-parva, Rhoduns-ocellatus-smithii, Sarcocheilichthys-variegatus.

During 1962-1970, 715 freshwater fishes were examined for metacercaria of C. sinensis. Those fishes were collected from 13 stations around the Lake Biwa. The metacercarial infection was found in 8 species of the fishes out of 19 species examined, those were Pseudorasbora parva, Sarcocheilichthys variegatus, Rhoduns ocellatus smithii, Gnathopogon elongatus elongatus, G. elongatus caerulescens, Acheilognathus rhombea, A. lanceolata and Biwai zezera. The infection incidence was generally high in those collected from southern part of the lake, e.g. in station 9, 92 out of 150 P. parva were infected with the metacercaria. The stool examination of man was carried out at 11 villages or towns around the lake using HCl-ethanol concentration technique between 1963 and 1966. The egg of C. sinensis was detected in 190 out of 1645 examined (11.6%). The infection rate was very low in northern parts (A and B) of the lake. It was considerably high in other parts, usually between 10-20% and in some villages more than 20%, with one exception of village K which showed 4.3%. Although the infection rate was markedly high in adult age group, the fact that 3.4% of children less than 10 yr old were positive for ova suggested the possibility of recent infections.--Copyright 1973, Biological Abstracts, Inc.
W73-13112

A COMPARISON OF THE ZOOPLANKTON COMMUNITIES IN SEVEN MOUNTAIN LAKES NEAR LILLEHAMMER, NORWAY (1896 AND 1971),
Norsk Institutt for Vannforskning, Blindern.
A. Langeland.
Norw J Zool. Vol 20, No 3, p 213-226. 1972. Illus.
Identifiers: Biomass, Fish, Lakes, *Norway (Mesna catchment), *Phytoplankton, Pollution, *Zooplankton.

During April, June and Aug 1971 phytoplankton and zooplankton investigations were performed in 7 mountain lakes in the Mesna catchment area near Lillehammer, Norway, and the results compared with earlier plankton investigations in 1896 (Huitfeldt-Kaas 1906). The great biomass of phytoplankton and zooplankton indicates lakes with relatively high primary and secondary production. It is assumed that this is mainly caused by natural conditions. The high ratio between phytoplankton and zooplankton biomass in some of the lakes indicates an unstable ecological equilibrium state. The qualitative and quantitative changes in the plankton community during the last 75 yr are assumed to have been caused by heavy fish predation, impoundment and pollution.--Copyright 1973, Biological Abstracts, Inc.
W73-13117

EFFECTS OF DDT UPON SALMON FROM SCHOODIC LAKE, MAINE,
Maine Dept. of Inland Fisheries and Game, Augusta.
D. O. Locke, and K. Havey.
Trans Am Fish Soc. Vol 101, No 4, p 638-643. 1972. Illus.
Identifiers: Blueberry, *DDT, Lakes, *Maine (Schoodic Lake), *Salmon, Synergistic effect, Water pollution effects.

Schoodic Lake, a relatively large glacial kettle located in the blueberry growing area of Washington County, Maine, is in a section where pesticides have been used intensively in blueberry culture for many years. DDT was implicated as the cause of a high hatchery mortality of landlocked salmon eggs and fry from Schoodic Lake in 1968-1969. This implication prompted a controlled study in 1970 to determine more exactly the effects of the pesticide upon salmon eggs and fry with Schoodic Lake as the parental source. DDT and metabolites in salmon eggs and fry from Schoodic Lake ranged from 7.21 to 10.41 ppm as opposed to 0.28 to 1.31 ppm in control fish from West Grand Lake. The Schoodic lot had a total mortality to feeding of 66% as opposed to a 30% mortality in the West Grand Lake fish. DDT and metabolites in mature salmon from Schoodic Lake in fall, 1969 ranged from 4.03 to 12.22 ppm in contrast to a range of 0.11 to 1.03 ppm in mature salmon from West Grand Lake. DDT and metabolites in mature salmon from Schoodic Lake in fall, 1970 ranged from 3.40 to 8.76 ppm. The increased use of guthion, an organophosphate, in the Schoodic Lake area may have a detrimental synergistic effect with DDT upon fish.--Copyright 1973, Biological Abstracts, Inc.
W73-13120

THE EFFECTS OF METHOXYCHLOR ON FISHES: I. ACUTE TOXICITY AND BREAKDOWN STUDIES,
Michigan Dept. of Natural Resources, Ann Arbor. Inst. for Fishery Research.
J. W. Merna, M. E. Bender, and J. R. Novy.
Trans Am Fish Soc. Vol 101, No 2, p 298-301. 1972. Illus.
Identifiers: *Fathead minnows, Fish, *Methoxychlor, Perch, *Toxicity (Acute), Wetting, *Yellow perch.

The rate of breakdown of methoxychlor (a DDT substitute) in water varies considerably with the water source. The half life attributable to hydrolysis in distilled water exceeds 200 days; the half life may be as short as 1 day in water of high biological activity. Static toxicity studies were unreliable due to the rapid breakdown of methoxychlor. Continuous flow studies yielded TL50 (median tolerance limit) values of 7.5 micrograms/l for fathead minnows and 20 micrograms/l for yellow perch. These values are considerably lower than others in the literature. The difference is probably due to the use of a wetting agent to achieve better solution of methoxychlor.--Copyright 1973, Biological Abstracts, Inc.
W73-13122

PRODUCTIVITY AND DISTRIBUTION OF TRICHOPTERA LARVAE IN A COLORADO MOUNTAIN STREAM,
Southern Methodist Univ., Dallas, Tex. Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-13124

TRENDS IN METHODOLOGY FOR EVALUATION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS,
Fisheries Research Board of Canada, West Vancouver, (British Columbia). Pacific Environment Inst.
M. Waldichuk.
CRC-Critical Reviews in Environmental Control, Vol 3, No 2, p 167-211, February 1973. 2 fig, 3 tab, 378 ref.

Descriptors: On site investigations, *Analytical techniques, *Methodology, Evaluation, *Water pollution effects, *Ecosystems, *Reviews, *Pollutant identification, Bioassay, Laboratory tests, Marine fish, Cold-water fish, Animal physiology, Primary productivity, Secondary productivity, Laboratory equipment, Instrumentation, Growth stages, Marine algae, Marine bacteria, Crustaceans, Mollusks, Marine animals, Invertebrates, Toxicity, Lethal limit, Animal behavior, Solvent extractions, Ion exchange, Colorimetry.
Identifiers: Pollutant effects, Marine environment, Macroinvertebrates, Bioaccumulation, Data interpretation, Median tolerance limit, Electrolytic extraction, Acclimation, Petroleum hydrocarbons, Scuds, Steelhead trout, Sockeye salmon, White sucker, Species diversity, Most probable number test, Ion exchange chromatography, Gas liquid chromatography, Adsorption chromatography, Thin layer chromatography, Paper chromatography, High pressure liquid chromatography, Liquid-liquid extraction.

The literature related to biological and chemical methodology for evaluating the effects of pollutants on marine organisms is reviewed. Research findings are considered from the very pragmatic point of view and the review is an extension of the presentation on the subject made earlier. In this case, it does not cover in depth broader considerations of physiological and biochemical studies on the effects of pollutants on marine organisms, from which there is an ever-increasing literature. Also, much of the microbiological research on marine pollution has been largely unreviewed. (Mortland-Battelle)
W73-13171

AVOIDANCE OF PESTICIDES BY GRASS SHRIMP (PALAEMONETES PUGIO),
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
D. J. Hansen, S. C. Schimmel, and J. M. Keltner Jr.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 129-133, March 1973. 3 tab, 6 ref.

Descriptors: *DDT, *Endrin, *2 4-D, Bioassay, Animal behavior, *Pesticide toxicity, Water pollution effects, Crustaceans, Chlorinated hydrocarbon pesticides, Phosphothioate pesticides, Carbamate pesticides, *Shrimp.
Identifiers: *Dursban, *Malathion, *Sevin, Avoidance, Palaemonetes pugio, Grass shrimp, Macroinvertebrates, Median tolerance limit.

The capacity of the euryhaline grass shrimp, Palaemonetes pugio, to avoid water polluted by DDT, endrin, Dursban, malathion, Sevin, or 2,4-D was evaluated. Grass shrimp were sieved from ponds and acclimated for at least 5 days in the laboratory at 20 percent salinity and 20 C. Avoidance was tested by allowing the shrimp to move from a holding area into one of two section, one with pesticide polluted water and the other with unpolluted water. Light was excluded during experiments. It was assumed, and corroborated in preliminary tests, that in the absence of pollutants the shrimp would enter the two areas with equal frequency. Chi-square tests were used to analyze the results. The shrimp avoided 1.0 and 10.0 ppm concentrations of the herbicide 2,4-D but did not avoid any of the five insecticides. Given a choice between two concentrations of 2, 4-D, they chose the lower concentration. The data suggest that shrimp may be extremely vulnerable to pesticide pollution because they are very sensitive to pesticides and are unlikely to avoid water polluted by them. (Mortland-Battelle)
W73-13173

INORGANIC NITROGEN REMOVAL FROM WASTEWATER: EFFECT ON PHYTOPLANKTON GROWTH IN COASTAL MARINE WATERS,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, K. R. Tenore, and H. I. Stanley.
Science, Vol 180, No 4089, p 955-956, June 1, 1973. 1 fig, 1 tab, 9 ref.

Descriptors: *Nitrogen, Waste water treatment, *Phytoplankton, Growth rates, *Bioassay, Marine algae, *Tertiary treatment, *Nutrient removal, Sea water, Nutrient requirements, Nutrients, Ponds, Eutrophication, Phosphorus, Limiting factors, Water pollution control, Efficiencies, Chrysophyta, Plant growth.
Identifiers: Pollutant removal, *Algal growth potential, Coastal waters, Chaetoceros simplex.

Algal bioassays were used to demonstrate the high efficiency of a combined tertiary wastewater treatment and marine aquaculture system in removing inorganic nitrogen, and to show that the coastal waters off Woods Hole, Massachusetts, are limited in nitrogen for marine phytoplankton growth. When nutrients were removed from secondarily treated domestic wastewater through assimilation by phytoplankton in an outdoor growth pond, the pond effluents, in varying dilutions with seawater, could not support more phytoplankton growth than the seawater alone. However, when nitrogen was added back to the mixtures of pond effluent and seawater, the phytoplankton growth response was similar to that with a mixture of wastewater and seawater. This is similar to the findings of other researchers, and suggests that nitrogen may be the key growth-limiting nutrient in many coastal marine waters. The combined tertiary treatment-marine aquaculture system appears to be an effective means of removing nitrogen from secondarily treated wastewater and controlling eutrophication of coastal marine waters. (Mortland-Battelle)
W73-13179

BENTHIC MACROINVERTEBRATE COMMUNITY STRUCTURE IN A GREAT PLAINS STREAM RECEIVING FEEDLOT RUNOFF,
Kansas State Teachers Coll., Emporia.
C. W. Prophet, and N. L. Edwards.
Water Resources Bulletin, Vol 9, No 3, p 583-589, June 1973. 4 tab, 8 ref.

scriptors: *Feed lots, *Benthic fauna, Biologi- communities, Water quality, Mollusks, igochaetes, Gastropods, Biomass, Clams, uatic insects, Annelids, *Farm wastes, Water llution effects, Dragonflies, Stoneflies, Water mpling, Mayflies, Caddisflies, Midges, Water etles, Systematics, Diptera, Invertebrates, minant organisms, Organic matter, Kansas, uations.
ntifiers: *Species diversity index, *Feedlot ru- ff, *Macroinvertebrates, Data interpretation, eches, Turbellaria, Species diversity, covery, Repopulation, Cottonwood River, gs, Sphaerium, Isonychia, Paraleptophlebia, dropsyche, Cheumatopsyche, Stenelmis, Fin- nail clam, Black flies, Ameletus, Caenis, Pota- ia, Hydroptilia, Ithytrichia, Chironomus, ypedilum, Simulium, Moths, Alderflies, Dam- flies.

e effect of feedlot runoff on the environmental ality of the Cottonwood River in east central nsas was evaluated by analysis of community ucture of benthic macroinvertebrates using the cies diversity index, (d bar). The benthic fauna ng the study reach was dominated by mayflies, idisflies, midges, riffle beetles, and the ecypod, Sphaerium. Sixty-five taxa were ntified during the study; the benthic fauna was st abundant during the 1968-69 segment of the dy. However, the mean species diversity index station indicated the river was subject to derate environmental stress, and species diver- indices of those stations immediately vnstream from feedlots were significantly ver than the species diversity index at the con- l station. There was a significant increase in cies diversity indices during the 1970-71 seg- nt of the study, following the closing of two dlots. The results indicate periodic feedlot ru- ff had a continuing adverse effect on the en- onmental quality of the river, but recovery was id as the organic load on the river was reduced. ortland-Battelle)
73-13180

OXIDATION AND FATE OF (C-14)ALDRIN INSECTICIDE-RESISTANT AND SUSCEPTI- E POPULATIONS OF MOSQUITOFISH AMBUSIA AFFINIS),
ssissippi State Univ., State College. Dept. of ology.
r primary bibliographic entry see Field 05B.
73-13190

ME PROCEDURES FOR ISOLATING TOXIC ETABOLITES OF PHOSPHOROTHIONATE STICIDES FROM ANIMAL TISSUES AND UIDS,
nistry of Agriculture, Fisheries and Food, ybridge (England). Central Veterinary Lab.
r primary bibliographic entry see Field 05A.
73-13196

LITERATURE SURVEY OF OCEAN POLLU- ON,
tholic Univ. of America, Washington, D.C. Inst. Ocean Science and Engineering.
r primary bibliographic entry see Field 05B.
73-13211

RROSION AND SCALING IN NUCLEAR- TIMULATED GEOTHERMAL POWER ANTS,
lifornia Univ., Livermore. Lawrence Liver- re Lab.
r primary bibliographic entry see Field 08H.
73-13231

UCOSE FLUX AT THE SEDIMENT-WATER TERFACE OF TORONTO HARBOUR, LAKE ONTARIO, WITH REFERENCE TO POLLU- TION STRESS,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-13236

INFLUENCE OF SULFITE ON GROWTH, SLIME, AND FLUORESECENT PIGMENT FOR- MATION BY PSEUDOMONAS AERUGINOSA,
Eastern Regional Research Lab., Philadelphia, Pa.
S. A. Palumbo.
Canadian Journal of Microbiology, Vol 19, No 4, p 505-511, April 1973. 2 fig, 4 tab, 21 ref.

Descriptors: *Cultures, *Pigments, *Growth rates, *Water pollution effects, *Sulfur compounds, Iron, Slime, Incubation, Hydrogen ion concentration, Temperature, Nutrients, Turbidity, Environmental effects.
Identifiers: *Pseudomonas aeruginosa, *Sulfites, *Bacterial physiology, Fluorescent pigments, Culture media, Pyocyanine, Bisulfites.

Substitution of sulfite for sulfate in the defined pyocyanine medium of Frank and DeMoss 1959 allowed formation of fluorescent pigments and slime by Pseudomonas aeruginosa NRRL B-4014. This formation of fluorescent pigments was both pH and iron dependent. The unadjusted medium (pH 8.25) containing sulfite and Fe (3 plus) allowed both growth and fluorescent pigment formation. Growth and fluorescent pigment formation were observed from a pH of 9.0 down to a pH of 7.5. At pH 7.5, the concentration of HSO3 (minus) is 0.0006 M, and this ion appears to be the active agent in inhibiting growth below pH 7.5. When the medium was adjusted to pH 7.0, neither fluorescent pigment formation nor growth was observed. The acid used for pH adjustment did not influence the minimum pH for growth. In the presence of small amounts of iron (ca. 1.0 microM Fe (3 plus)), the organism shifted from a blue to a yellow-green fluorescent pigment. Cultural conditions such as temperature and nutrients which supported growth also supported slime formation as well as fluorescent pigment formation. (Mortland-Battelle)
W73-13237

EFFECT OF DYES ON BACTERIAL GROWTH,
Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-13243

METABOLISM OF NITRILOTRIACETATE BY CELLS OF PSEUDOMONAS SPECIES,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 05B.
W73-13244

INTERACTING EFFECTS OF PH, TEMPERA- TURE, AND SALT CONCENTRATION ON GROWTH AND SURVIVAL OF VIBRIO PARAHAEMOLYTICUS,
Georgia Univ., Experiment. Div. of Food Science.
L. R. Beuchat.
Applied Microbiology, Vol 25, No 5, p 844-846, May 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Growth rates, *Hydrogen ion concentration, *Temperature, *Sodium chloride, *Environmental effects, Heat resistance, Salt tolerance, Enteric bacteria, Pathogenic bacteria, Thermal pollution, Lethal limit, Water pollution effects, Marine bacteria, Anaerobic bacteria.
Identifiers: *Survival, *Vibrio parahaemolyticus, Chemical concentration, Culture media, Recovery.

Thermal resistance and minimal pH and temperature conditions for growth of Vibrio parahaemolyticus in artificial media containing 3 and 7 percent sodium chloride were studied. Growth was observed at pH 4.8 and at 5C. To study thermal resistance a 0.3-ml portion of a 24-h culture was dispensed into tubes containing 19.7 ml of Trypticase soy broth (TSB) with 3 percent NaCl which had been tempered at 53 plus or minus 0.2 C (128 F) in a water bath. Heating menstrua had been adjusted to pH values ranging from 5.0 to 8.0 in 0.5-unit increments. Samples were withdrawn, and dilutions were made immediately by using a 3 percent NaCl in water dilutent before plating in Trypticase-soy-agar (TSA) with 3 percent NaCl tempered at 45C. Recovery was at 37C, and counts were made after 24 h of incubation. Extensive growth at 5C was not observed at the pH values examined; no growth was observed at 2C. Growth at 5 and 9C was only at an alkaline pH. There was a tendency for growth at lower pH's as the incubation temperature was increased, regardless of NaCl concentration. With the exception of strain 4750, V. parahaemolyticus was demonstrated to grow at lower pH values in the TSB with 3 percent NaCl at pH 4.8 when incubation was at 30C, the lowest pH tolerance observed in the study. The six strains were least sensitive to heat at pH 7.0 and most sensitive at pH 5.0. (Mortland-Battelle)
W73-13245

SYNERGISTIC BIO-EFFECTS OF OIL AND IR- RADIATION IN AN AQUATIC ORGANISM, TARICHA GRANULOSA,
Environmental Protection Agency, Rockville, Md. Office of Research and Monitoring.
W. L. Lappenbusch, and J. M. Ward.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 75-79, February 1973. 2 fig, 6 ref.

Descriptors: *Oil, *Irradiation, *Water pollution effects, *Toxicity, *Radioactivity effects, Lethal limit, Animal pathology, X-rays, Bioassay, Laboratory tests, Mortality.
Identifiers: *Synergistic effects, *Rough-skinned newt, Histopathology, Necropsy, Animal tissues.

A study was conducted to determine lethal toxicity of oil and the possible synergistic effects of oil on the radiosensitivity of the rough-skinned newt (Taricha granulosa). After acclimitization at 10C to simulate winter conditions newts were initially placed in 4000 ml of water containing 0, 0.5, 1.0, 2.5, 5, 10, 20, or 50 percent by volume regular nondetergent motor oil. After determining oil toxicity levels, additional newts were classified in four groups prior to irradiation. One group was unexposed to either oil or irradiation, a second was irradiated only, a third was continuously exposed to 0.5 percent oil but not irradiated, and a forth continuously exposed to 0.5 percent oil and irradiated. The newts then absorbed 0, 1000, 2500, 5000, or 10,000 rads of x-rays. Their behavior, physical appearance and activity, and mortality were observed. Several dead newts of each group were necropsied and their tissues were examined. Oil toxicity was found to be acute, not chronic, at concentrations of 2.5 percent and higher. Newts subjected to 1,000, 2,500, 5,000, and 10,000 rads has mean survival times of 141, 117, 85 and 54 days. For those subjected to 0.5 percent oil and radiation these survival time were lowered to 98, 75, 53, and 29 days. It was concluded that exposure to oil increases the radiosensitivity of this newt synergistically. (Mortland-Battelle)
W73-13248

RESIDUES OF DDT IN COD FROM NORWEGI- AN FJORDS,
Norges Veterinarhoegskole, Oslo. Dept. of Pharmacology and Toxicology.
For primary bibliographic entry see Field 05A.
W73-13249

TOXICITY OF METHYL MERCURY FOR STEELHEAD TROUT SPERM,
Oregon Cooperative Fishery Unit, Corvallis.
J. D. McIntyre.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 98-99, February 1973. 1 tab, 2 ref.

Descriptors: *Toxicity, *Mercury, *Rainbow trout, Viability, Water pollution effects, Reproduction, Bioassay, Cold-water fish, Cytological studies.
Identifiers: *Sperm, *Methylmercury, *Steelhead trout, Salmo gairdneri, Methylmercuric chloride, Cell physiology.

Concentrations of methylmercuric chloride that would reduce the viability of sperm from the steelhead trout were determined. Sperm obtained from five fish was combined, and 0.1-ml aliquots were removed and inoculated into test tubes containing mercury concentrations of 1 g/l to 10 mg/l. The samples were maintained at 11C. The sperm was left in solution 30 minutes and then combined with 100 steelhead eggs from a single female. Percentage of fertilization was determined on the 17th day. Reduced fertilization of eggs indicated that concentrations of mercury greater than or equal to 1 ppm reduced sperm viability. At concentrations greater than 1 ppm the reductions increased sharply. (Mortland-Battelle)
W73-13250

CADMIUM TOXICITY AND ACCUMULATION IN SOUTHERN NAIAD,
Oklahoma Univ. Health Sciences Center, Oklahoma City. Dept. of Environmental Health.
J. E. Cearley, and R. L. Coleman.
Bulletin of Environmental Contamination and Toxicology , Vol 9, No 2, p 100-101, February 1973.

Descriptors: *Cadmium, *Toxicity, *Bioassay, Water pollution effects, Absorption, Food chains, Path of pollutants, Salts, Spectrophotometry, Chlorophyll, Turgidity, Plant physiology, Heavy metals, Aquatic plants.
Identifiers: *Southern naiad, *Bioaccumulation, *Najas guadalupensis, Stolons, Cadmium sulfate, Sample preparation, Ashing, Biological magnification, Mobilization, Macrophytes.

The effects of three different levels of cadmium on the uptake and accumulation of this metal by the southern naiad, a waterweed, were investigated. A static bioassay was conducted over a 21-day period using duplicate exposure chambers for each exposure level. The plants were acclimated for 2 weeks and the roots removed before placement in the containers. Plants were exposed to different Cd levels for 0, 11, and 21 days. After exposure, the plant tissues were rinsed, dried for 24 hrs at 100C, and ashed for 24 hours. Metal determinations were made by spectrophotometry. The exposed plants showed reductions of chlorophyll, turgor and stolon development not seen in controls. Toxic reactions and Cd accumulation by the plants increased as the exposure levels increased, which suggested that (a) Cd accumulation, ca. 1000 fold, was a direct function of the exposure level, and (b) the detoxifying mechanism was over-taxed at a more rapid rate at the higher levels resulting in an earlier impairment of physiological function. It is evident that this common aquatic plant is capable of introducing potentially toxic quantities of cadmium into the food chain of higher organisms, e.g. sunfish and waterfowl. (Mortland-Battelle)
W73-13251

FATTY ACID COMPOSITIONS OF PARACOLONS: ARIZONA, CITROBACTER, AND PROVIDENCIA,
Cornell Univ. Medical Coll., New York. Dept. of Microbiology.
N. A. Machtiger, and W. M. O'Leary.
Journal of Bacteriology, Vol 114, No 1, p 80-85, April 1973. 3 fig, 3 tab, 20 ref.

Descriptors: *Enteric bacteria, *Coliforms, Aerobic bacteria, Organic acids, Chemical analysis, Pollutant identification, Pathogenic bacteria
Identifiers: *Arizona arizonae, *Citrobacter freundii, *Providencia alcalifaciens, *Providencia stuartii, *Fatty acids, *Chemical composition, Flame ionization gas chromatography, Culture media, Sample preparation.

The fatty acid compositions of stationary-phase cultures of Arizona arizonae, Citrobacter freundii, Providencia alcalifaciens, Providencia stuartii, and Providencia sp. were studied. All organisms were grown in chemically defined media. Stationary-phase cells were harvested by centrifugation at 8200 times g for 20 min at 5 C, washed once in distilled water, and recentrifuged. The cell pastes were lyophilized, weighed and growth was measured turbidimetrically at 600 nm. Total cellular fatty acids were extracted from dry cells, methylated, and analyzed by dual-column, dual flame ionization gas chromatography. The major fatty acids of A. arizonae, C. freundii, and Providencia were 16:0, 16:1, 17:cyclopropane, and 19:cyclopropane. The fatty acid compositions of the two strains of A. arizonae examined were similar to each other, but the three strains of C. freundii differed from one another in their fatty acid compositions. In both A. arizonae and C. freundii, the relative quantities of saturated, unsaturated, and cyclopropane fatty acids were similar to those which have been found in stationary-phase cultures of other members of the Enterobacteriaceae. The three strains of Providencia also differed from one another in their fatty acid compositions. In all three strains the total quantity of unsaturated fatty acids was larger and that of the cyclopropane fatty acids was smaller than those found in stationary-phase cultures of other enteric bacteria. (Holoman-Battelle)
W73-13252

SURVIVAL OF SALMONELLA TYPHIMURIUM IN ANIMAL MANURE DISPOSAL IN A MODEL OXIDATION DITCH,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
L. A. Will, S. L. Diesch, and B. S. Pomeroy.
American Journal of Public Health, Vol 63, No 4, p 322-326, April 1973. 1 fig, 2 tab, 21 ref.

Descriptors: *Pollutant identification, *Farm wastes, *Oxidation lagoons, *Model studies, *Waste disposal, Public health, Biochemistry, Dissolved oxygen, Hydrogen ion concentration, Temperature, Cultures, Sampling, Pathogenic bacteria, Aerobic bacteria, Methodology.
Identifiers: Survival, *Salmonella typhimurium, Fluorescent antibody techniques, Biochemical tests, Feces, Sample preservation, Culture media, Serology, Fecal coliforms, Leptospira pomona, Enrichment.

A laboratory model oxidation ditch was constructed to evaluate potential health effects of pathogens in cattle manure. The studies were conducted in a 1:10 scale model with pH, DO, temperature, and total solids regulated to simulate a field unit at summer (20C) and winter (2C) temperatures. Liquid manure obtained from a field ditch was placed in the laboratory ditch. Stock cultures of biologically and serologically pure Salmonella typhimurium were grown on tryptic soy agar and seeded into the ditch. Various cultural methods were used in measuring survival and differentiation was accomplished both biochemically and serologically. At summer temperatures S. typhimurium survived for 17 days post-seeding and at winter conditions for 47 days. The data indicated that survival was of greatest duration in the sludge portion of settling chambers. Attempts were made during the tests to use fluorescent antibody methods for measurement but these were not as successful as anticipated. Retrieval of fluorescent organisms from the enrichment phase media was more successful than sampling directly from the oxidation ditch manure. (Mortland Battelle)
W73-13253

METHANOL METABOLISM IN PSEUDOMONAD C,
Hadassah Medical School, Jerusalem (Israel)
B. Stieglitz, and R. I. Mateles
Journal of Bacteriology, Vol 114, No 1, p 390-398, April 1973. 8 fig, 5 tab, 19 ref

Descriptors: *Metabolism, *Pseudomonas, *Radioactivity techniques, Nutrient requirements, Assay, Enzymes, Carbon radioisotopes, Aerobic bacteria, Oxidation, Electron microscopy, Colorimetry, Spectrophotometry, Bicarbonates, Absorption
Identifiers: *Methanol, *Substrate utilization, *Fate of pollutants, Bacterial physiology, Pseudomonads, Methanol dehydrogenase, Enzymatic activity, C-14, Assimilation, Hexose phosphate synthetase, Sample preparation, Paper chromatography, Culture media, Formaldehyde, Formates, Ethanol, Methylamine, Succinates, Citrates, Lactates, Serine, Glyoxylates, Pyruvates, Propanol, Butanol, Formate dehydrogenase, Formaldehyde dehydrogenase, Glycerate dehydrogenase

Cell suspensions of pseudomonad C, a bacterium capable of growth on methanol as sole carbon source, were able to oxidize methanol, formaldehyde, and formate, although the rates of oxidation for the latter two compounds were much slower. The latter compounds also could not serve as sole carbon sources. Through the use of labeled compounds, it was shown that in the presence of methanol, formaldehyde, formate, and bicarbonate were incorporated into trichloroacetic acid-precipitable material. Hexose phosphate synthetase activity was found, indicating the assimilation of methanol via an allulose pathway. No hydroxypyruvate reductase activity was found, nor was any complex membrane structure observed. Such a combination of characteristics has been observed in an obligate methylotroph (Psuedomonas W1), but pseudomonad C can utilize a variety of non-methyl substrates. (Holoman-Battelle)
W73-13256

METABOLISM OF ENDOTHALL BY AQUATIC MICROORGANISMS,
Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
H. C. Sikka, and J. Saxena.
Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 402-406, May/June 1973. 5 fig, 3 tab, 16 ref.

Descriptors: *Aquatic microorganisms, *Metabolism, *Microbial degradation, *Aquatic environment, *Cultures, Lakes, Hydrosols (Soils), Aquatic bacteria, Bottom sediments, Herbicides, Radioactivity techniques, Amino acids, Proteins, Lipids, Inhibition, Path of pollutants, Chromatography.
Identifiers: *Fate of pollutants, *Endothall, *Arthrobacter, *Substrate utilization, Biological magnification, Assimilation, Degradation products, 7-Oxabicyclo (2.2.1)heptane-2 3-dicarboxylic acid, Mobilization, Nucleic acids, Citric acid, Glutamic acid, Aspartic acid, Alanine, Monofluoroacetate, Sample preparation.

(C-14)Endothall (7-oxabicyclo (2.2.1)heptane-2,3-dicarboxylic acid) labeled in the oxabicyclo ring was readily degraded by microorganisms in lake water and hydrosoil through a pathway involving splitting of the ring. An Arthrobacter species isolated from hydrosoil by the enrichment method was able to utilize endothall as the sole source of carbon and energy for its growth. The C-14 from endothall was incorporated into cellular amino

acids, proteins, nucleic acids, and lipids and was also released as C-1402. After short-term incubation of the Arthrobacter with (C-14)endothall, C-14 was incorporated into citric, aspartic, and glutamic acids and some unidentified compounds. (C-14)Glutamic acid accounted for a large proportion of the total C-14 incorporated into the alcohol-soluble cell fraction. Treatment with 0.02 M monofluoroacetate caused a severalfold accumulation of (C-14) citric acid, but only partially inhibited the incorporation of C-14 into glutamic acid. It appears, therefore, that the C-14 from C-14-ring-labeled endothall is incorporated into glutamic acid via the tricarboxylic acid cycle and an alternate, unknown pathway. (Holoman-Battelle)
W73-13258

THE DETERMINATION OF ALL DETECTABLE ELEMENTS IN THE AQUATIC PLANTS OF LINSLEY POND AND CEDAR LAKE (NORTH BRADFORD, CONNECTICUT) BY X-RAY EMISSION AND OPTICAL EMISSION SPECTROSCOPY,
Pittsburgh Univ., Pa. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-13261

UPTAKE AND ACCUMULATION OF DDT AND PCB BY EPHEMERA DANICA (EPHEMEROPTERA) IN CONTINUOUS-FLOW SYSTEMS,
Lund Univ. (Sweden). Dept. of Zoology.
A. Sodergren, and Bj. Svensson.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 6, p 345-350, June 1973. 1 fig, 2 tab, 13 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, Absorption, *Mayflies, *Pesticide kinetics, Laboratory tests, Pesticide residues, Mathematical models, Gas chromatography, Chlorinated hydrocarbon pesticides, Aquatic insects, Immature growth stage, Bioassay, Water pollution effects.
Identifiers: *Ephemera danica, *Bioaccumulation, Continuous flow system, Nymphs, p p'DDT, Metabolites, p p'DDE, p p'DDD.

The kinetics of uptake and accumulation of DDT and PCB by mayflies was examined in a continuous-flow systems. Fifty Ephemera danica nymphs were used as test organisms and were introduced to the continuous-flow system immediately after collection from a Swedish stream. DDT and PCB were dissolved in ethanol and added to the systems. Five nymphs were then withdrawn each day for residue analysis. During the nine days of the experiment the animals received no food so that uptake was strictly via the gills and integument. Gas chromatography was used for residue analysis. Uptake and accumulation of both substances followed a similar pattern. After 4-5 days exposure an apparent constant level was established, indicating equilibrium between uptake and excretion of the substances. The accumulation of residues as a function of the concentration in the water showed a similar pattern. A kinetic equation of the first order is proposed as a model for uptake. (Mortland-Battelle)
W73-13265

A METHOD FOR RTING CHEMICALS FOR POTENCY AGAINST FISH AND OTHER ORGANISMS,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking.
US Bur Sport Fish Wildl Invest Fish Control. 36-38. 3-8. 1970. Illus.
Identifiers: Chemicals, *Fish, Methods, Organisms, *Toxicity ratings, Lethal limit, Water pollution effects.

A potency rating system by which the toxicity of chemicals to organisms can be assessed with a minimum of data from preliminary bioassays was presented. This method permitted effective and rapid evaluation of toxicity when data from preliminary tests were inadequate for statistical analysis. In bioassays of chemicals against fish, the mortality was recorded in 3-96-hr tests when exposed to 3 concentrations. The potency rating of a bioassayed chemical, when compared with the maximum value on the rating scale, indicated the relative toxicity of the chemical. Concentrations and exposure times could be changed to fit a specific bioassay program. Results of 24-or 48-hr bioassays could be compared with 96-hr bioassays because the maximum values of the rating scales were approximately equal at all time intervals. The potency rating was more applicable to toxicants with similar dose-effect curves.--Copyright 1973, Biological Abstract, Inc.
W73-13269

PERSISTENCE OF VIRUS AND BACTERIA IN SEAWATER,
California Univ., Berkeley. School of Public Health.
W. D. Won, and H. Ross.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE3, p 205-211, June 1973. 6 fig, 1 tab, 9 ref.

Descriptors: *Sea water, *Persistence, *E. coli, *Environmental effects, *Enteric bacteria, *Viruses, Coliforms, Water temperature, Water pollution, Domestic wastes, Public health, Organic wastes, Organic compounds.
Identifiers: Survival, Echo 6 virus, Culture media, Enrichment, Enterovirus, Cell morphology, Fecal pollution, Feces, Yeast extract, Trypticase soy broth, Casamino acid, Peptone, Heart infusion broth, Casitone.

At a temperature of 38 F-40 F bacterial survivals (Escherichia coli) were significantly enhanced in seawater deliberately 'polluted' with small concentrations of organic materials (25 ppm-500 ppm) including peptone, heart infusion, casamino acid, yeast extract, trypticase soy, and human feces. In a warmer environmental temperature the survival enhancing property of these substances became growth promoting resulting in a 40-fold population increase followed with a marked increase in microbial persistence lasting at least 18 weeks. These substances were also capable of stabilizing cell and colony morphology. The same phenomenon was not observed in parallel experiments with Echo 6 virus. In this instance, cold temperature per se appeared more effective in enhancing survival time. Inactivation rate was gradual and the virus persisted for 14 weeks at 38 F-40 F, contrasted sharply with an 8-day persistence at an environmental temperature of 72 F. (Holoman-Battelle)
W73-13272

ECOLOGY OF TWO RELATED SPECIES OF CADDIS FLY LARVAE IN THE ORGANIC SUBSTRATES OF A WOODLAND STREAM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-13286

MERCURY CONTAMINATION OF FISH IN NORTHWESTERN ONTARIO,
Acres (H. G.) and Co. Ltd., Niagara Falls (Ontario).
N. Fimreite, and L. M. Reynolds.
Journal of Wildlife Management, Vol 37, No 1, p 62-68, January 1973. 2 fig, 4 tab, 17 ref.

Descriptors: *Mercury, *Freshwater fish, Water pollution effects, *Industrial wastes, Water pollution sources, Rock bass, Walleye, Lake trout, Water pollution, Path of pollutants, Lakes, Rivers, Absorption, *Canada.
Identifiers: *Chlorine plants, *Atomic absorption spectrophotometry, Northern pike, White sucker, Burbot, Biological samples, Sample preparation, Acid digestion, Clay Lake, Wabigoon River, Ball Lake, Tide Lake, Indian Lake, Grassey Narrows Lake, Tetu Lake, Big Canyon Lake, Long Legged Lake, Sumach Lake, Oak Lake, Maynard Lake, Scotty Lake, Dumpy Lake, Lennan Lake, Rowdy Lake, Sydney Lake, Roger Lake.

Fish to be analyzed for mercury were gill-netted from 18 lakes and rivers in Northern Ontario, some of which were upstream and downstream from a chlorine plant which had leaked about 3,000 lbs of mercury annually from 1962-1970. Samples consisted of 186 specimens of walleye, northern pike, lake trout, burbot, rock bass, and white sucker. Mercury content was determined in lateral musculature by wet digestion of the samples followed by cold vapor atomic absorption spectrophotometry. The maximum mercury levels in northern pike, burbot, and walleye were 27.8, 24.8, and 19.6 ppm respectively, measured in specimens taken 50-60 miles downstream from the plant. They decreased proportionally to the distance from the plant but were clearly elevated even 200 miles downstream. The levels in specimens from suspected uncontaminated lakes were generally below 1 ppm but frequently above the 0.2 ppm often considered as the maximum background concentrations. The latter finding may possibly be explained on the basis of the oligotrophic conditions characteristic for these lakes. (Little-Battelle)
W73-13287

COMPARATIVE TOXICITY OF 29 NITROSALICYLANILIDES AND RELATED COMPOUNDS TO EIGHT SPECIES OF FISH,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking, and W. A. Willford.
US Bur Sport Fish Wildl Invest Fish Control. 36-38. 3-11. 1970.
Identifiers: Black bullheads, Bluegill, Carp, Fathead minnows, *Fish, Goldfish, Green sunfish, Minnow, *Nitro salicylanilides, Rainbow trout, Organic compounds, Species, *Toxicity, Yellow perch.

The relative potencies of 29 nitrosalicylanilides and related structures against rainbow trout, goldfish, carp, fathead minnows, black bullheads, green bullheads, green sunfish, bluegills and yellow perch were determined in 96-hr static bioassays and varied from zero to the maximum potency of the system, depending on the type and position of substitutions. The 4'-substitutions on 3-nitrosalicylanilide were essential in producing high toxicity and selectivity to fish. The toxic activity of nitrosalicylanilides increased as halogen substitutions were shifted from the 2' to the 3' and to the 4' positions on the aniline moiety. Activity increased as molecular weight of the substituent increased. 4'-Azophenyl-3-nitrosalicylanilide and 4'-iodo-3-nitrosalicylanilide were more toxic than 4'-bromo- or 4'-chloro-3-nitrosalicylanilide. The dihalo-substituted 3-nitrosalicylanilides were more toxic than monohalo-substituted 3-nitrosalicylanilides provided one of the halosubstitutions was at the 4'-position on the aniline moiety. 4'-Bromo-3-nitrosalicylanilide was more toxic to carp, fathead minnows, bluegills and yellow perch than to rainbow trout. Several compounds were selective to yellow perch. Goldfish were the most resistant species to the salicylanilides.--Copyright 1973, Biological Abstracts, Inc.
W73-13288

ECOLOGICAL EFFECTS OF OFFSHORE DREDGING AND BEACH NOURISHMENT: A REVIEW,
University of Southern Mississippi, Hattiesburg.
J. R. Thompson.

Available from the National Technical Information Service as AD-756 366, $3.00 in paper copy, $1.45 microfiche. Miscellaneous Paper No 1-73, January 1973. 39 p, 196 ref.

Descriptors: *Dredging, *Sediments, Ecosystems, *Environmental effects, *Coastal engineering, Bibliographies, Reviews, Benthic flora, Bottom fish, Biota, Turbidity, Suspended solids, Benthic fauna, Zoning, Abstracts, Documentation, Bottom sediments, Data collections, Marine bacteria, Physical properties, Chemical properties, Ecology, Coasts, Marine algae, Marine fish.
Identifiers: *Beach nourishment, Marine environment.

A review of ecological effects of offshore dredging is presented, based on literature review and personal contacts, to provide a framework for determination of need for further knowledge. In general, little concrete effort aimed specifically at the determination of effects of offshore dredging was uncovered, although basic ecological works that are generally applicable are available. Much additional research of basic, but practical, orientation is needed to approach full understanding. The beach may be divided into three zones on the basis of moisture and biota found. The possible effects on these biota resulting from offshore dredging and deposition of sediments on a beach are described. Background descriptive material and impacts on both offshore dredged areas and nourished beaches, and suggestions for further research follow. (Mortland-Battelle)
W73-13290

EFFECT OF THERMAL SHOCK ON VULNERABILITY TO PREDATION IN JUVENILE SALMONIDS. II. A DOSE RESPONSE BY RAINBOW TROUT TO THREE SHOCK TEMPERATURES,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
C. C. Coutant.
Available from the National Technical Information Service as BNWL-1519, $3.00 in paper copy, $1.45 microfiche. Report No UC-48, November 1972. 12 p, 2 fig, 1 tab, 7 ref. Contract No AEC AT (45-1)-1830.

Descriptors: *Thermal pollution, *Predation, *Thermal stress, *Chinook salmon, *Rainbow trout, *Laboratory tests, Water temperature, Lethal limit, Juvenile fish, Bioassay, Water pollution effects, Time, Heat resistance.
Identifiers: *Thermal shock, Salmo gairdneri, Oncorhynchus tshawytshcha.

Juvenile rainbow trout (Salmo gairdneri) were found to be more vulnerable to predation following thermal shock, dependent on the thermal dose (temperature and duration) received. The fish were exposed to temperatures of 26, 28, and 30C for periods from 0.5 to 100 minutes. Control fish were exposed to unheated water. Control and shocked fish were then reunited at the acclimation temperature and offered to adult rainbow trout predators. The predators were allowed a maximum of 15 minutes to remove about 50 percent of the prey and the remaining test and control fish were counted. A chi-square analysis was used on the results. At 30C exposure, an identifiable effect in vulnerability of the shocked fish occurred after only 0.55 min exposure. At 28C, an exposure of about 2 min was needed to increase vulnerability. The 26C exposure temperature, included significantly different predation rates after 64 min but not after 16 or 32 min. (Mortland-Battelle)
W73-13291

NITROGEN METABOLISM IN THE SEA.
Lamont Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 05B.
W73-13292

TOXICITY OF 33NCS (3'-CHLORO-3-NITROSALICYLANILIDE) TO FRESHWATER FISH AND SEA LAMPREY,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking, E. L. King, C. R. Walker, and J. H. Howell.
US Bur Sport Fish Wildl Invest Fish Control 36: 38. 3-16. 1970.
Identifiers: Bowfin, Carp, Catfish, Channel, Chlor 3-Nitro, Fish, *Fresh water fish, *Salicylanilides, *Sea lamprey, Sunfish, *Toxicity, Trout, Water pollution effects.

The chemical 33NCS (3'-chloro-3-nitrosalicylanilide) was evaluated as a fish control agent and as a larvicide for sea lampreys. The chemical was rapidly toxic to many species. Sea lampreys, bowfin and channel catfish were the most sensitive species. Carp were more sensitive than trouts or sunfishes. Use of 33NCS in selective control of freshwater fishes or sea lampreys required precise control because its toxicity was strongly influenced by variations in water quality.--Copyright 1973, Biological Abstracts, Inc.
W73-13293

A REPORT ON BACTERIAL POLLUTION AFFECTING SHELLFISH HARVESTING IN NEWPORT RIVER, NORTH CAROLINA.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div
For primary bibliographic entry see Field 05B.
W73-13298

ACCUMULATION AND RETENTION OF 85SR MARKS BY YOUNG LARGEMOUTH BASS,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
M. H. Shealy, Jr., and C. A. Carlson.
1971. 42 P. OWRR A-013-NY (7). 14-01-0001-927, 1400, 1852, 14-31-0001-3032.

Descriptors: *Bass, *Marking techniques, Radioecology, *Mortality, *Radioactivity effects, Growth stages, Strontium radioisotopes.
Identifiers: *Fish embryos.

First-year mortality in largemouth bass, Micropterus salmoides (Lacepede), is often higher than 90%. To better understand the role of predation by aquatic invertebrates in this high death rate, young bass were marked at four different ages with 85Sr for subsequent use in predation studies. Resulting radiostrontium accumulation and retention curves indicate that this radionuclide is suitable for quantitative marking of prolarval, postlarval, and juvenile bass, but not embryos. Bass embryos were exposed to one, and prolarval and older stages to three, 85Sr concentrations at 20 to 23C. Exposure energies ranged from 0.0 (controls) to 89.1 microCi/liter pond water. Twelve-hr radioaccumulation and retention rates were obtained for embryos (2 days old). Radioaccumulations were monitored in prolarvae (<1 day old) at 12-hr intervals from 12 to 168 hr, in postlarvae (15 days old) at 24-hr intervals from 24 to 144 hr, and in juveniles (40 days old) at 24-hr intervals from 24 to 120 hr. Bass from all accumulation experiments were transferred, after various periods of exposure, to pond water to which no 85Sr was added, and mark retentions were evaluated for periods of up to 106 days.
W73-13304

FRESHWATER ECOLOGY.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-13341

MARINE SCIENCES.
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-13343

FATE AND EFFECTS OF RADIONUCLIDES IN ALASKA.
Battelle Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.
For primary bibliographic entry see Field 05B.
W73-13348

THE ANOPHELES GAMBIAE COMPLEX AND MALARIA TRANSMISSION AROUND KISUMU, KENYA,
East African Inst. of Malaria and Vector-borne Diseases, Amani (Tanzania)
G. B. White
Identifiers: *Anopheles-Gambiae, Fenitrothion, Insecticides, *Kenya (Kisumu), *Malaria transmission

The environment surrounding Kisumu in Kenya, East Africa, is described, emphasizing the importance of the Nyando valley as a highly malarious area compared with the Nandi and Kisii hills where only epidemic malaria occurs. Available data on malaria transmission are summarized. The varying seasonal importance of A. gambiae as a vector in the different topographical areas is discussed. Data resulting from a brief survey of the A. gambiae complex (Nov. 10-Dec 3, 1970) conducted during very hot and dry weather are presented to show that Species A and Species B resting in houses are differentially distributed in this part of Nyanza. Species B predominated in the lowlands and was prolific in the artificially irrigated areas. Species A predominated in the highlands. Both sibling species were well represented in sympatric association among foothills. Only 3 females of A. gambiae (1A and 2B) were obtained from the experimental area of 23 square miles employed by the World Health Organization (WHO) for hut testing of fenitrothion for anopheline control. Circumstances indicated that both Species A and Species B formerly occurred more abundantly in this zone. Although Species A was restricted virtually to the highlands and foothills at this season, populations of A. probably would encroach into the lowlands during raining periods. WHO data on parous rates of A. gambiae at 2 localities near Kisumu are presented to show that Species B may continue reproducing at a greater rate than Species A as the dry season progresses.--Copyright 1973, Biological Abstracts, Inc.
W73-13386

NITROGEN-FIXING BLUE-GREEN ALGAE OF SOILS, RICE FIELDS AND EPHEMERAL BASINS OF THE SOUTHERN UKRAINE, (IN RUSSIAN),
L. P. Prykhod'kova.
Ukr Bot Zh. Vol 28, No 6, p 753-758. 1971. English summary.
Identifiers: *Algae (Nitrogen-fixing), Anabaena-variabilis, Cylindrospermum-Michailovskoense, Nitrogen, Nostoc-Commune, Nostoc-Linckia, Rice fields, *Soils, *Ukraine (USSR), *Cyanophyta.

Of the 23 spp. found, 12 spp. were from soils (southern chernozems, dark-brown, chestnut, solonetz, gley-solods, solonchaks, meadow, bog and sands), 16 from the ephemeral basins and 18 from the rice fields. Many species were seen rarely in small amounts. Nostoc commune (Vauch.) in sensu Elenk., N. linckia (Roth.) Born. et Flah. in sensu Elenk., Cylindrospermum michailovskoense Elenk., Anabaena variabilis Kuetz. and others were sometimes dominant in the soils and basins. The blue-green algae developed more abundantly in the rice fields. The amount of N-fixing species at the beginning of rice vegetation is negligible and increases in Aug. and Sept. In the subsaline basins blue-green algae N-fixers were more frequent and more diverse.--Copyright 1973, Biological Abstracts, Inc.

W73-13391

EXPERIMENTAL STUDY OF THE EFFECT OF TEMPERATURE ON SOME PIKE PARASITES, (IN RUSSIAN),
Leningrad State Univ. (USSR).
B. I. Kuperman, and R. E. Shul'man.
Vestn Leningr Univ. Ser Bio. Vol 27, No 1, p 5-15. 1972. English summary.
Identifiers: Ergasilus-Sieboldi, *Parasites, *Pike, *Temperature effects, Triaenophorus-Crassus, Triaenophorus-Nodulosus.

The effect of temperature on the lifecycle of Triaenophorus nodulosus, T. crassus and Ergasilus sieboldi was investigated. The change of temperatures from winter and autumn to spring and summer had different effects on the parasites. The temperature affects the parasites indirectly, as it changes the physiological state of the host, and this in turn affects the parasites.--Copyright 1973, Biological Abstracts, Inc.
W73-13399

SURVEY OF ENVIRONMENTAL RADIOACTIVITY, JANUARY 1-DECEMBER 31, 1972,
Ames Lab., Iowa.
For primary bibliographic entry see Field 05B.
W73-13402

MODEL OF THE ACCUMULATION OF FOSSIL CO2 IN THE ATMOSPHERE AND THE SEA,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-13403

USE OF HANFORD WASTE PONDS BY WATERFOWL AND OTHER BIRDS,
Battelle-Pacific Northwest Labs., Richland, Wash.
R. E. Fitzner, and K. R. Price.
Available from NTIS, Springfield, Va., as BNWL-1738; $4.00 in paper copy, $1.45 in microfiche. Report BNWL-1738, February 1973. 47 p, 7 fig, 4 tab, 19 ref.

Descriptors: *Washington, *Waterfowl, *Absorption, *Nuclear wastes, Census, Mallard duck, Ringnecked duck, Migratory birds, Game birds, Radioisotopes, Absorption, Food webs, Public health, Food chains, Radioactivity effects, Path of pollutants, Aquatic habitats, Ponds, Cooling water.

Irrigation and hydroelectric development in the Columbia Basin have increased waterfowl. Four waste ponds in an area of the Hanford Reservation are being observed that range from 17-71 acres in acrea, 2-10 feet in depth, and have radioactivity less than 50 picoCuries/ml. Sampling has shown that there is insufficient radioactivity in the birds to be hazardous to human consumption. A census of birds over a year (16 species of waterfowl and 90 species of other birds) indicated that remote, large-area, and deep ponds were most attractive. Eighty-five percent of the species were migrants; Mallard ducks and Ring-necked ducks were the most abundant species and were present for long times. It is planned to study radionuclide uptake by a colony of young birds in the spring, and of populations simulating wintering waterfowl. Information about the general life history of the species observed is reviewed. (Bopp-ORNL)
W73-13404

AMCHITKA BIOENVIRONMENTAL PROGRAM. RESEARCH PROGRAM ON MARINE ECOLOGY, AMCHITKA ISLAND, ALASKA, JULY 1, 1971-JUNE 30, 1972,
Washington Univ., Seattle.
R. E. Nakatani, J. S. Isakson, and R. L. Burgner.
Available from NTIS, Springfield, Va., as BMI-171-150; $5.45 in paper copy, $1.45 in microfiche. Report BMI-171-150, April 1973. 73 p, 11 fig, 9 tab, 22 ref, 3 append.

Descriptors: *Marine algae, *Marine fisheries, *Nuclear explosions, *Alaska, Marine animals, Intertidal areas, Aquatic habitats, Autogenic succession, Sampling, Monitoring, Invertebrates, Fish populations, Fishkill, Environmental effects.

Effects on marine fish, invertebrates, and algae were studied including radiological sampling. The Cannikin nuclear test caused permanent uplift of intertidal benches about 6.1 km alongshore, disrupting algae and invertebrates; but recovery of fish populations is expected since only a small habitat area was disrupted. In the smaller area of disruption from the Milrow test, Hedophyllum alga replaced Fucus, leading to growth comparable to that on nearby undisturbed rocks; compared with 1971 observations, an area of siltation on the intertidal bench was reduced in size. (Bopp-ORNL)
W73-13405

FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND. JULY 1, 1971-JUNE 30, 1972,
Utah State Univ., Logan.
W. T. Helm, and R. A. Valdez.
Available from NTIS, Springfield, Va., as BMI-171-148; $4.00 in paper copy, $1.45 in microfiche. Report BMI-171-148, April 1973. 17 p, 3 fig, 4 tab, 4 ref.

Descriptors: *Water pollution effects, *Alaska, *Nuclear explosions, *Aquatic habitats, Fishkill, Fish populations, Environmental effects, Lakes, Streams, Silting, Oil pollution, Smolt, Salmon.

The Cannikin test drained 5 freshwater lakes (by fissures and tilting) that are not expected to refill and support fish. Drilling mud spillage from a retention pond severely depleted aquatic life in one small stream. Another stream similarly polluted during the Milrow test showed recovery from pollution. Pollution of streams (about 5% of the total) and lakes (about 0.2%) by drainage of oil and silt may have longer-lasting effects. Smolting of coho salmon was studied. (Bopp-ORNL)
W73-13406

METHODOLOGY FOR THE IDENTIFICATION OF A BIOLOGICAL INDICATOR IN RADIOECOLOGY: EXAMPLE OF CS137 AND A FRESHWATER MOLLUSC ANODONTA, (METHODOLOGIE POUR LA RECHERCHE D'UN INDICATEUR BIOLOGIQUE EN RADIOECOLOGIE),
For primary bibliographic entry see Field 05A.
W73-13407

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SURRY POWER STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50280-75. $7.60 per copy, $1.45 microfiche. Docket 50280-75, May 1972. 286 p, 39 fig, 32 tab, 175 ref, 10 append.

Descriptors: *Nuclear powerplants, *Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Virginia.
Identifiers: *Pressurized water reactors, James River, *Environmental impact statements.

This final environmental statement relates to the proposed issuance of an operating license for the Surry Power Station Unit 1. The plant is located in Surry County, Virginia, and will employ two pressurized water reactors which will be covered by water from and returned to the James River. Environmental impacts are assessed, and, after consideration of alternatives, an environmental benefit-cost summary was compiled. Some environmental factors considered include hydrology (surface water and groundwater), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to issue an operating license for Unit 1 subject to the following conditions: (1) establish a monitoring program, both radiological and nonradiological to determine the impact of the plant on the environment, (2) monitor the number and species of fish kills attributed to operation of the station. (Houser-ORNL)
W73-13408

AQUATIC, BIOENVIRONMENTAL STUDIES IN THE COLUMBIA RIVER AT HANFORD 1945--1971. A BIBLIOGRAPHY WITH ABSTRACTS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W73-13409

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE ST. LUCIE PLANT UNIT NO. 1.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50335-63; $7.60 per copy, $1.45 microfiche. Docket 50335-63, June 1973. 284 p, 21 fig, 31 tab, 115 ref, 2 append.

Descriptors: *Nuclear powerplants, *Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Florida, Atlantic Ocean, Iodine.
Identifiers: *Pressurized water reactors, Indian River, Big Mud Creek, *Environmental impact statements.

This final environmental statement relates to the proposed continuation of construction and issuance of an operating license for the St. Lucie Plant Unit No. 1. The plant is located on Hutchinson Island on the East Coast of Florida, midway between the cities of Fort Pierce and Stewart. It will use a pressurized-water reactor cooled by a once-through system with water from and discharged to the Atlantic Ocean. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to continue the construction permit and issue an operating license subject to the following conditions: (1) Minimize beach construction activities during turtle nesting season. (2) Restore disturbed dune area. (3) Maintain I-131 release as low as practicable. (4) Plant pines for light screens. (5) Perform an aquatic monitoring program. (6) Determine the effect of the thermal plume on turtle nesting. (7) Conduct a radiological monitoring program. (8) Ensure that the thyroid dose though food

chain (grass-cow-milk) does not exceed 5 mrem/yr. (9) Monitor residual chlorine concentration. (10) Define a comprehensive environmental monitoring program and include in specifications. (11) Provide an analysis and plan of action against any detrimental effects found. (Houser-ORNL)
W73-13410

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE CONTINUATION OF CONSTRUCTION OF UNIT 2 AND THE OPERATION OF UNITS 1 AND 2 MILLSTONE NUCLEAR POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket No. 50336-65, $7.60 per copy, $1.45 microfiche. Report No. Docket 50336-65, June 1973. 315 p, 24 fig, 47 tab, 138 ref, 2 append.

Descriptors: *Nuclear powerplants, Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Water cooling, Connecticut, *New York.
Identifiers: *Boiling water reactor, *Pressurized water reactors, Niantic Bay, Long Island Sound, *Environmental impact statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed continuation of construction permit for Unit 2 and operation licenses for Units 1 and 2 Millstone Nuclear Power Station. This station is located in the town of Waterford, Connecticut. Cooling is by a once-through flow of water from Niantic Bay which is discharged through a quarry pond and back into Long Island Sound. Unit No. 1 is a boiling water reactor and Unit No. 2 a pressurized water reactor. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to continue the construction permit for Unit 2 and issue operating licenses for Units 1 and 2 subject to the following conditions: (1) applicant shall define acceptable comprehensive environmental sampling monitoring, and surveillance programs as a part of technical specifications for Units 1 and 2; (2) a further study of the discharge of water from the quarry to Long Island Sound to minimize entry of aquatic organism into the quarry; (3) continue study to lessen impingement of aquatic bodies on the cooling water intake screens; (4) provide analysis and propose a course of action to alleviate problems found by the monitoring programs. (Houser-ORNL)
W73-13411

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE CONSTRUCTION OF SUSQUEHANNA STEAM ELECTRIC STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50387-40; $7.60 per copy, $1.45 microfiche. Report No. Docket 50387-40, June 1973. 323 p, 41 fig, 48 tab, 181 ref, 6 append.

Descriptors: *Susquehanna River, *Nuclear powerplants, Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Pennsylvania.
Identifiers: *Boiling water reactors, *Environmental impact statements.

This final environmental statement relates to the proposed construction of the Susquehanna Steam Electric Station. This station is located on the Susquehanna River near Berwick in Luzerne County, Pennsylvania, and will employ two boiling water reactors. The exhaust steam will be cooled by water in a closed cycle circulated through two hyperbolic natural-draft cooling towers. All water used in the operation will be drawn from and ultimately discharged to the Susquehanna River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded to issue a construction permit for the facility subject to the following conditions: (1) Re-seed transmission rights-of-way. (2) Control iodine releases to not exceed 5 mrem annual thyroid dose to a child via the air-cow-milk pathway. (3) Submit a list of chemicals for cleaning purposes and a method of waste disposal for approval. (4) Implement an environment monitoring program to determine ecological effects. (5) Conduct a preoperational radiological monitoring program to establish a baseline. (6) Provide an analysis and plan of action to eliminate harmful effects found. (Houser-ORNL)
W73-13412

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF NINE MILE POINT NUCLEAR STATION UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket No 50410-35; $13.60 per copy, $1.45 microfiche. Report No. Docket 50410-35, June 1973. 566 p, 27 fig, 43 tab, 136 ref, 13 append.

Descriptors: *Nuclear powerplants, *Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *New York, Lake Ontario.
Identifiers: *Boiling water reactors, *Environmental impact statments.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of the Nine Mile Point Nuclear Station Unit 2. The station is located in Scriba, New York, and will employ a boiling water reactor cooled by once-through water drawn from and discharged to Lake Ontario. The discharge will be combined with Unit No. 1 discharge. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was complied. Environmental factors include hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue a construction permit subject to the following conditions: (1) Provide a biological sampling program for ecological data. (2) conduct a monitoring and sampling program at intakes to determine fish kill. (3) conduct a preoperational radiological monitoring program for base line evaluations. (4) implement a surveillance program to determine unanticipated effects. (Houser-ORNL)
W73-13413

ACTIVATION ANALYSIS OF TRACE ELEMENTS IN BIOLOGICAL MATERIALS, (ANALYSE PAR ACTIVATION DE MECROQUANTITES D'ELEMENTS DANS LES MATERIAUX BIOLOGIQUE),
For primary bibliographic entry see Field 05A
W73-13420

OCCURRENCE OF SE75 AND SN113 IN OYSTERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div
For primary bibliographic entry see Field 05A
W73-13424

DIETARY INTAKE OF COBALT BY THE ADULT POPULATION OF TARAPUR,
Tarapur Atomic Power Station (India).
For primary bibliographic entry see Field 05B.
W73-13426

LABORATORY OBSERVATIONS ON THE EARLY GROWTH OF THE ABALONE, HALIOTIS SORENSENI, AND THE EFFECT OF TEMPERATURE ON LARVAL DEVELOOMENT AND SETTLING SUCCESS,
Scripps Institution of Oceanography, La Jolla, Calif.
D. L. Leighton.
Fishery Bulletin, Vol 70, No 2, p 373-381, 1972. 6 fig, 1 tab, 16 ref.

Descriptors: *Growth rates, *Temperature, *Shellfish, *Larvae, Biology, Aquatic animals, Aquatic environment, Metabolism, Mortality, Nutrients, Growth stages, Environmental effects, Laboratory tests.
Identifiers: *Abalone.

The influence of temperature on larval development rate and growth of juveniles of the white or Sorensen's abalone, Haliotis sorenseni, was investigated using a thermal gradient apparatus. While larvae developed most rapidly at 20C, most settled juveniles at that temperature did not survive. At 15 to 16 C, however, the operculate veliger stage was attained in 72 hours and settlement of advanced individuals occurred in 9 days. No settling was observed at 10 C. Juveniles maintained at 15 to 19 C and provided mixed diatoms as food showed marked variability in growth rate; at 130 days shell length ranged from 4.0 to 8.0 mm (average 5.5 mm). Two distinctly different patterns of shell pigment distribution emerged with continued growth. Approximately 60% of the juveniles were bicolored, red and yellow-green, while the remainder had an even tone of red-violet. (Jerome-Vanderbilt)
W73-13428

CHANGE IN FEEDING AND BODY CONDITION OF BROWN BULLHEADS OVERWINTERING IN THE HEATED EFFLUENT OF A POWER PLANT,
Essex Marine Lab.,Conn.
R. R. Massengill.
Chesapeake Science, Vol 14, No 2, p 138-141, 1973. 1 fig, 1 tab, 10 ref.

Descriptors: *Winter, *Growth rates, *Food habits, *Bullheads, *Heated water, Thermal pollution, Environmental effects, Fish, Fish behavior,

asonal, Feeding rates, Aquatic environment, -site data collections, Evaluation, Electric werplants.

nter food habits and condition factors of the wn bullhead, Ictalurus nebulosus, were deter- ned from specimens collected in the discharge al of the Connecticut Yankee Atomic Com- y plant and Chapman Pond, a cove of the Con- ticut River unaffected by artificial heating. mach content analysis indicated that fish over- tering in the heated discharge fed, while those vater at 2 C from Chapman Pond did not. Fish, elids, insects, molluscs and zooplankton were sumed, with fish as the most abundant food. llheads began feeding before the temperature ched 4 C in Chapman Pond. The normal bull- d diet of invertebrates shifted to smaller fish in densely populated canal. Although bullheads in canal fed throughout the winter, their body dition was poorer than that of fish overwinter- in Chapman Pond. (Jerome-Vanderbilt)
3-13430

STER HERPES-TYPE VIRUS,
tional Marine Fisheries Service, Oxford, Md. idle Atlantic Coastal Fisheries Center.
G. Banfield, G. Kasnic, Jr., and W. S. Foster. ence (Wash). Vol 178, No 4062, p 759-760. 1972. s.
ntifiers: Crassostrea-virginica, *Herpes-type us, *Oysters, *Viruses, Invertebrates.

erpes-type virus infection, the first to be found n invertebrate animal, is reported in the oyster ssostrea virginica. Intranuclear herpes-type l inclusions were more prevalent in the oyster levated water temperatures of 28 -30 C than at mal ambient temperatures of 18 -20 C. The in- sions were associated with a lethal disease at elevated temperatures.--Copyright 1973, logical Abstracts, Inc.
3-13437

OLOGICAL COMPARISONS OF THER- LLY AFFECTED AQUATIC ENVIRON- NTS,
annah River Ecology Lab., Aiken, S.C.
D. Parker, M. F. Hirshfield, and J. W. Gibbons. rnal Water Pollution Control Federation, Vol No 4, p 726-733, April 1973. 1 fig, 3 tab, 13 ref, pend.

scriptors: *Nuclear power plants, *Thermal ution, *Effluents, *Environmental effects, ctric power production, Water pollution, ted water, Aquatic environment, Aquatic nts, Fish, Reptiles, *South Carolina, Reser- s, Evaluation.
ntifiers: Par Pond (So Car).

tudy is reported of three reservoirs, located r the U.S. Atomic Energy Commission's annah River electric power plant at Aiken, ., which are differently affected by the thermal uent from nuclear reactors. These reservoirs e chosen because they were isolated from an interference and indicated no evidence of mical pollution. The object was to obtain infor- ion on species composition and the relative ndance of certain biological components scular aquatic plants, fishes, and reptiles). One rvoir received thermal effluent, another was overing after intense thermal loading, and the d had no direct elevation of water temperature. effect of thermal loading was the elimination everal species of vascular aquatic plants and ebrates which was still evident several years r heating had been terminated. Relative ndance of other plant species was con- uently enhanced, possibly as a result of ced competition from other species. Appendix ts the vascular aquatic plant species found in three reservoirs. Appendix II lists the fish spe- . Appendix III lists the reptile species. (Jerome nderbilt)
W73-13439

LOW-TEMPERATURE ACCLIMATION AND THE SEASONAL TEMPERATURE SENSITIVITY OF SOME TROPICAL MARINE FISH,
Smithsonian Tropical Research Inst., Balboa, Canal Zone.
J. B. Graham.
Physiological Zoology, Vol 45, No 1, p. 1-13, January 1972. 7 fig, 6 tab, 17 ref.

Descriptors: *Seasonal, *Cold resistance, *Heat resistance, *Tropical regions, *Marine fish, Biology, Animal physiology, Adaptation, Temperature, Aquatic environment, Metabolism, Respiration, Mortality, Oxygen demand.

Seasonal changes in upper and lower lethal temperatures have been measured in four ecologically different species of tropical marine fish. Also two species were monitored for seasonal changes in their oxygen consumption rates and the oxygen consumption rates of three species were measured after they had been acclimated to 17C for at least 6 weeks. None of the species studied makes seasonal temperature compensations such as those commonly found in temperate-zone fishes. All fish studied were capable of acclimating to 17C, but the extent of the capacity and resistance adaptations varies for each species and is related to differences in littoral distribution. A positive correlation between upper lethal temperature and habitat temperature of Abudefduf troschelii from different locations, the wide range of thermal tolerances found for the species studied and their capacity for cold acclimation attest to the eurythermality of tropical marine species. (Jerome-Vanderbilt)
W73-13453

INFLUENCE OF PHENOL AND TEMPERATURE ON THE RESPIRATION OF A FRESHWATER SNAIL HELISOMA TRIVOLVIS,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Zoology.
M. J. Sheanon, and F. B. Trama.
Hydrobiologia, Vol 40, No 3, p. 321-328, 1972. 1 fig, 1 tab, 22 ref.

Descriptors: *Thermal pollution, *Invertebrates, *Phenols, *Inhibitors, *Respiration, Biochemistry, Water pollution, Environmental effects, Aquatic environments, Aquatic animals, Bethnic fauna, Freshwater, Pollutants, Heat, Metabolism, Laboratory tests, Measurement, Evaluation, *Snails.

The interactive influence of temperature and phenol (p-hydroxy benzene) on the rate of oxygen uptake for a freshwater snail, Helisoma trivolvis was investigated. Snails were collected en masse in early July 1969, and held in aquaria in dechlorinated tap water at 15 C. Twenty-four hours before tests, snails were transferred to another tank. Oxygen consumption was measured factorially at 0, 2.0, 20.0 and 40.0 mg/liter of phenol and at 5, 15 and 25 C temperatures. The analysis of variance indicated a highly significant value for the influence of phenol on oxygen uptake. This was most evident at 15 and 25 C; metabolic rate at 5 C was so slowed down that differences were impossible to measure. It appeared that all three phenol levels had a more or less uniform effect on oxygen consumption. The slow down of metabolic activities due to low temperatures was of the same magnitude as that due to a deleterious chemical. Snails exposed to as much as 40 mg phenol/liter for the three to four hour test period apparently recovered fully when returned to clean river water. (Jerome-Vanderbilt)
W73-13454

THE EFFECT OF TEMPERATURE ON THE DEVELOPMENT RATE OF THE MAJOR LIFE STAGES OF DIAPTOMUS PALLIDUS HERRICK,
Missouri Univ., Columbia. Div. of Biological Sciences.
W. T. Geiling, and R. S. Campbell.
Limnology and Oceanography, Vol 17, No 2, p. 304-307, March 1972. 2 fig, 14 ref. WP-00379.

Descriptors: *Temperature, *Growth rates, *Animal physiology, Juvenile growth stages, Invertebrates, Physiology, Biology, Environmental effects, Lakes, Eutrophication, *Copepods.
Identifiers: Development rate, *Eggs, Life stages, *Diaptomus pallidus.

Diaptomus pallidus Herrick were raised from the egg to adulthood at 10, 15, 20 and 25C under ad libitum feeding conditions. Times spent in the egg, nauplius, and preadult life stages were recorded. Egg to adult times ranged from 66.2 days at 10C to 14.6 at 25C. Development rate plateaued between 15 and 20C, largely because of the similarity in time spent in the preadult copepodid stages. Such a plateau, well documented for other temperature related physiological functions in invertebrates, is inconsistent with the suggestion that it may be possible to predict the entire range of temperature response of development rate for all stages of copepods using Belehradek's equation with certain minimal measurements. (Oleszkiewicz-Vanderbilt)
W73-13456

INVERSE COMPENSATION FOR TEMPERATURE IN OXYGEN CONSUMPTION OF THE HYLID FROG PSEUDACRIS TRISERIATA,
Colorado State Univ., Fort Collins. Dept. of Zoology.
G. C. Packard.
Physiological Zoology, Vol 45, No 3, p. 270-275, 1972. 1 fig, 3 tab, 23 ref.

Descriptors: *Metabolism, *Frogs, *Respiration, *Temperature, Biology, Animal physiology, Oxygen demand, Adaptation, Environmental effects, Resistance, Laboratory tests.

This investigation tests the hypothesis that, because the chorus frog (Pseudacris triseriata) remains active at low temperatures, partial compensation for temperature might be expected as a pattern of metabolic response to low temperature acclimation. Following acclimation to 5C or to 25C for at least 4 days, oxygen consumption of chorus frogs was measured at 10C or 20C by differential respirometry. Short-term compensation for temperature conformed with the pattern of inverse translation, frogs acclimated at the low temperature having lower metabolic rates than frogs acclimated at the high temperature. There is reason to believe that a temperature of 5C may have been sufficiently low to induce cold torpor in the animals, in which case inverse compensation may have been an adaptive response permitting conservation of energy reserves. (Jerome-Vanderbilt)
W73-13458

EFFECTS OF TEMPERATURE, SALINITY, AND DISSOLVED OXYGEN ON THE SURVIVAL OF STRIPED BASS EGGS AND LARVAE,
California State Dept. of Fish and Game, Sacramento. Anadromous Fisheries Branch.
J. L. Turner, and T. C. Farley.
California Fish and Game, Vol 57, No 4, p. 268-273, 1971. 4 tab, 8 ref.

Descriptors: *Striped bass, *Temperature, *Salinity, *Dissolved oxygen, *Reproduction, Water quality, Aquatic environment, Environmental effects, Fish eggs, Life cycles, Fish physiology, Laboratory tests, Test procedures, Measurements, Evaluation.

Laboratory tests were conducted to define the effects of temperature, salinity and dissolved oxygen on the eggs and larvae of striped bass in order to find what measures must be taken to protect the species from the increasing degradation of the freshwater environment. Adult striped bass were collected during their spawning migration and female fish were induced to ovulate. Eggs were collected, dry fertilized and placed into test containers. Some eggs were placed directly into test conditions, and others were water hardened first. Eggs were incubated at 18 salinity-temperature combinations. For the eggs placed directly into test conditions the survival was 88% or more of control in total dissolved solids of 1000 ppm. The highest survival occurred at 1000 ppm and 65 F, but survival decreased rapidly above 1000 ppm, especially at higher temperatures. The survival of eggs hardened in fresh water was higher at greater salinities and temperatures. In tests of the effects of dissolved oxygen-temperature, egg survival decreased with an increase of temperature or exposure time or a decrease in dissolved oxygen level. These experiments suggest that even moderate reductions of dissolved oxygen adversely affect the percents hatch of eggs and larvae survival. (Jerome-Vanderbilt)
W73-13460

THE EFFECT OF TEMPERATURE ON THE NUMBER OF CIRCULATING HEMOCYTES IN THE CALIFORNIA SEA HARE, APLYSIA CALIFORNIA,
National Marine Fisheries Service, Oxford, Md. Biological Lab.
G. B. Pauley, and S. M. Krassner.
California Fish and Game, Vol 57, No 4, p 308-309, 1971. 1 tab, 4 ref.

Descriptors: *Temperature, *Mollusks, *Metabolism, *Biological indicators, Aquatic environment, Animal physiology, Aquatic animals, Laboratory tests, Testing procedures, Measurements, Evaluation.
Identifiers: Blood cell count.

It was necessary to know the number of circulating hemocytes in the California sea hare in order to evaluate experimental results or pathological conditions. Observations of the total number of circulating blood cells at two different temperatures were made to obtain the needed information. Hemolymph was drawn from the engorged pedal sinus in 16 different animals of approximately equal size which had been held at 12 and 18 C for 1 week. This operation could be performed without trauma if the animal was held in a damp paper towel. The hemolymph was kept in sterile test tubes in an ice bath until cells were counted. Four counts were taken from each animal. Although the range of total hemocyte counts overlapped somewhat, the mean number of hemocytes present at 18 C (146-47 plus or minus 40.70) was nearly twice the number observed at 12 C (76.03 plus or minus 20.86). The total hemocyte values found in the California sea hare differ from those obtained for other mollusks, but, the temperature sensitivity compared favorably to studies of others. (Jerome - Vanderbilt)
W73-13461

RESEARCH NEEDS ON WASTE HEAT TRANSFER FROM LARGE SOURCES INTO THE ENVIRONMENT.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05G.
W73-13473

TEMPERATURE-DEPENDENCE OF PERMEABILITY TO WATER AND TO SODIUM OF THE GILL EPITHELIUM OF THE EEL ANGUILLA ANGUILLA,
Nice Univ. (France). Faculte des Sciences.
R. Motais, and J. Isaia.
Journal of Experimental Biology, Vol 56, No 3, p 587-600, June 1972. 2 fig, 6 tab, 31 ref.

Descriptors: *Eels, *Temperature, *Permeability, *Sodium, Biochemistry, Aquatic environment, Sea water, Freshwater, Aquatic animals, Metabolism, Diffusion, Flow, Transmissivity, Solutes, Evaluation, Animal physiology, Laboratory tests.
Identifiers: Blood, Gill.

In the eel, the gill rather than the skin is the principal water exchange surface. Previous results indicate that water crosses the gill of marine fish by simple diffusion and not by bulk flow. This study is an attempt to evaluate the importance of a possible solute-solvent interaction in the branchial epithelium of the seawater-adapted eel. The ratio of water permeability to sodium permeability is about 3 at 25 C, but drops to 1 at 5 C. This drop is mainly due to diminution of the water permeability. The relatively independent variations of permeabilities in the seawater-adapted fish indicate a certain dissociation between water and salt movements. The hypothesis concerning the presence of water-filled channels in the branchial epithelium of fresh water-adapted eels is supported. In the seawater-adapted eel the osmotic permeability is considerably higher than the diffusional permeability with the difference being greater the lower the temperature. This surprising result must signify either that the osmotic pressure difference between blood and seawater does not represent the true osmotic gradient or that a reabsorption of water linked with solutes occurs in a specialized region of the gill. (Jerome - Vanderbilt)
W73-13475

THERMAL EFFECTS ON AQUATIC ORGANISMS, ANNOTATED BIBLIOGRAPHY OF 1971 LITERATURE,
Oak Ridge National Lab., Tenn.
C. C. Coutant, E. E. Huber, and H. A. Pfuderer.
Available from the National Technical Information Service as ORNL-EIS-72-28, $3.00 in paper copy, $1.45 in microfiche. Report ORNL EIS 72-28, September 1972. 155 p, 404 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Aquatic life, *Bibliographies, Water quality, Temperature, Aquatic environment, Algae, Bacteria, Annelids, Biomass, Biochemistry, Behavior, Metabolism, Reproduction, Respiration, Growth rates, Fish, Laboratory tests, On-site tests, Measurements, Data collections, Evaluation, Feeding rates, Estuaries, Streams, Rivers, Lakes, Ponds, Oceans.

A review of the literature of 1971 dealing with the problem of thermal effects on aquatic organisms is presented. Abstracts of 404 articles are included on the following topics: reviews; site studies; producers, including effects on growth and production, and community responses; consumers, including reproduction and development, distribution, temperature tolerance, physiology of cold shocks, tissue and organ responses, growth, food transport, temperature-salinity interactions, radionuclide uptake, temperature and other stresses, feeding rates, preferred temperature, avoidance, orientation, activity, and predator prey relations; decomposers; disease; beneficial uses; and bibliographies. Indexes of authors, key words and taxonomic names, are presented, along with a key-word-in-context index on titles. (Jerome - Vanderbilt)
W73-13478

THE USE OF WATER QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THERMAL EFFECTS PROBLEM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05B.
W73-13479

A STUDY OF THE BLUE-GREEN ALGAE FROM PADDY FIELD SOILS OF INDIA,
Allahabad Univ (India). Dept of Botany
G. L. Tiwari
Hydrobiologia, Vol 39, No 3, p 335-350, May 19 1972. 3 tab. 24 ref.

Descriptors: *Cyanophyta, *Systematics, *Soil al gae, Soils, Sampling, Cultures, Bioindicators Anabaena, Nostoc
Identifiers: *India, Sample preservation, Sampl preparation, Culture media, Enrichment, Agar Microcystis spp, Gloeocapsa rupestris Gloeothece rupestris, Aphanocapsa spp Aphanothece spp, Dacylococcopsis fascicularis indica, Chamaesiphon rostafinsku, Arthrospir gomontiana var crassa, Spirulina major, Oscilla toria spp., Phormidium spp., Lyngbya spp., Micro cystis flos-aquae, Gloeothece spp., Aphanothec stagnina, Chroococcidiopsis mysorensis, Oscilla toria spp., Phormidium spp., Microcoleus spp Cylindrospermum spp., Nostoc spp., Anabaen spp., Scytonema spp., Microchaete spp Gloeotrichia spp., Hapalosiphon spp., Aulosir spp., Plectonema spp., Scytonematopsi ghazipurensis, Tolypothrix spp., Calothrix spp Symphyonemopsis katniensis, Hapalosiphon spp Westiellopsis prolifica.

Soil samples and algae were collected from ric fields in India in order to study the blue-green a gae. Collections were taken to a depth of one inc and were kept in sterilized Petri dishes fo preparation of enrichment cultures. Blue-gree algae found growing in the cultures were recorde and unialgal cultures obtained by direct isolatio or by streak cultures. A total of 132 forms were re ported including one new genus, three new spe cies, three new varieties, and 14 new form var ants. Of the total, 37.8 percent were from nature 48.4 percent obtained from culture, and 13.6 pe cent common to both. The study confirms earlie observations that soils contain a large number o viable algal species apart from those actually vis ble and that some algae reported from nature ma fail to appear under cultural conditions. Th heterocystous blue-green algae are seen less tha non-heterocystous in nature whereas in culture the condition is reversed. (Mortland-Battelle)
W73-13498

THE INTERACTION OF LIGHT INTENSITY AND DDT CONCENTRATION UPON THE MARINE DIATOM, NITZSCHIA DELICATISSIMA CLEVE,
Florida State Univ., Tallahassee. Dept. o Oceanography.
R. B. MacFarlane, W. A. Glooschenko, and R. C. Harriss.
Hydrobiologia, Vol 39, No 3, p 373-382, May 1 1972. 3 fig, 13 ref.

Descriptors: *DDT, *Light intensity *Phytoplankton, *Primary productivity Chlorinated hydrocarbon pesticides, Photosynthe sis, Water pollution effects, Chlorophyll, Carbon Cultures, Radioactivity techniques, Absorption Chrysophyta, Marine algae, Carbon radioisotopes
Identifiers: Nitzschia delicatissima, Chlorophyll a C-14.

A study was conducted to determine the effects o the interactions between DDT concentration an light intensity on marine phytoplankton wit respect to carbon-14 uptake, chlorophyll a con tent, and photosynthesis. Cultures of Nitzschi delicatissima were grown to concentrations o 75,000 cells per ml and DDT was then introduce in concentrations of 9.4, 23.5, 44, 88, 220, 500, an 1,000 ppb. Fifty-ml aliquots were placed in growth chamber at the desired light intensity an incubated for 24 hours and carbon-14 o chlorophyll a analysis was done. A consisten reduction in both C-14 fixation and chlorophyll was observed with increasing DDT concentra tions. Maximum reductions occurred at the highe

t intensities. However, since the lowest DDT centrations used were at least 100 times those orted in an estuarine study, it was concluded inhibition of primary production is probably occurring in nature except for very limited as, and then only in surface waters. (Mortland-telle)
3-13500

THOGENICITY OF FUNGI AND BACTERIA OM INDIA TO HYDRILLA AND WATER-ACINTH,
rida Univ., Gainesville. Dept. of Plant Patholo-

Charudattan.
acinth Control Journal, Vol 11, p 44-48, June 3. 3 fig, 3 tab, 9 ref. OWRR B-011-FLA (8), 14-0001-3268.

criptors: Plant pathology, *Aquatic weed con-, Biocontrol, *Pathogenic fungi, *Pathogenic teria, *Water hyacinth.
ntifiers: *India, *Hydrilla.

earch was made recently in India for pathogens ydrilla and waterhyacinth for biological con- purposes. Several fungi and bacteria were iso-d from surface-sterilized shoots and leaves of e plants that were diseased or suspected to be These organisms were brought to the Universi- of Florida and studied in a quarantine shouse. Pathogenicity tests with 40 fungi and acteria revealed that a Pythium and a Scleroti- species were damaging to hydrilla. Among 32 gi and 6 bacteria from waterhyacinth, Alter- a eichhorniae, Myrothecium roridum and zoctonia solani were virulent on this host. se three fungi have been previously reported pathogens of waterhyacinth in India. The ogens of hydrilla found in this study as well as wn pathogens of waterhyacinth will be as-ed as biocontrol agents of these plants in rida. (Morgan-Florida)
3-13502

THOGENICITY OF RHIZOCTONIA SOLANI AQUATIC PLANTS,
rida Univ., Gainesville. Dept. of Plant Patholo-

G. Joyner, and T. E. Freeman.
topathology, Vol 63, No 6, p 681-685, June 3. 1 fig, 22 ref. OWRR B-011-FLA (9), 14-31-1-3268.

criptors: Plant pathology, *Aquatic weed con-, Aquatic plants, *Water hyacinth, *Pathogenic gi, Biocontrol.
ntifiers: *Panama, *Rhizoctonia solani.

hizoctonia solani isolate (RhEa) from diseased noring hyacinth (Eichhornia azurea) in Panama pathogenic to several aquatic plants, particu-to water hyacinth (E. crassipies) and water ace (Pistia stratioites). Penetrating hyphae of Ea grew from infection cushions through the nates of water hyacinth leaves. Only the rsed portions of water pennywort drocotyle umbellata) and water hyacinth were cted by RhEa. Another R. solani isolate 11) infected both submersed and emersed por-s of these two plants. Disease, caused by Ea, in water hyacinth was severe at 28C, but as perature was increased to 32C, disease severi-ecreased and little or no damage was detected. ease severity in water hyacinth caused by ther R. solani isolate (H287) was the same at n 38 and 32C. (Morgan-Florida)
3-13503

E KINETICS OF NH4 UPTAKE BY RATOPHYLLUM,
ahoma State Univ., Stillwater. Dept. of Zoolo-

V. Toetz.

Hydrobiologia, Vol 41, No 3, p 275-290, 1973. 7 fig, 5 tab, 11 ref. OWRR A-023-OKLA (1), 14-31-0001-3836.

Descriptors: Lakes, *Ammonia, *Kinetics, *Eutrophication, *Oklahoma, Aquatic plants, Nutrients, Model studies, Ponds.
Identifiers: *Ceratophyllum.

The relationship between growth of aquatic plants and their nutrient supply is poorly understood, because of the lack of suitable models which could be tested in the field. The purpose of this research was to learn if the Michaelis-Menten expression describes the relationship between the uptake of NH4 in solution. A hyperbola results when uptake of NH4 by Ceratophyllum (v) is plotted against the concentration of NH4 in solution (S). The relationship is not described well by the Michaelis-Menten expression. Linear relationships exist between v and S at concentration less than 7 mg NH4-N (1)-1, suggests that a model for first order saturation kinetics might be appropriate. However, uptake is depressed by one half at low temperatures and some of the uptake is apparently related to processes which are not completely passive. The ecological usefulness of the Michaelis-Menten constants derived for Ceratophyllum is discussed.
W73-13504

SOND CRUISE 1965: FACTOR AND CLUSTER ANALYSES OF THE PLANKTON RESULTS, A GENERAL SUMMARY,
National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 05A.
W73-13507

ESTABLISHMENT OF INVERTEBRATE COMMUNITIES ON LOG SUBSTRATES IN THE KASKASKIA RIVER, ILLINOIS,
Illinois State Natural History Survey, Urbana.
H. C. Nilsen, and R. W. Larimore.
Ecology, Vol 54, No 2, p 366-374, Early Spring 1973. 2 fig, 4 tab, 5 ref.

Descriptors: *Deciduous trees, Natural streams, *Biological communities, *Invertebrates, *Periphyton, *Phytoplankton, Dominant organisms, Aquatic habitats, Aquatic habitats, Aquatic insects, Larvae, Oligochaetes, Ponds, Shallow water, Water levels, Rotifers, Crustaceans, Nematodes, Mollusks, Annelids, Systematics, Standing crops, Aquatic drift, Cottonwoods, *Illinois, Biomass, Water chemistry, Air temperature, Water temperature, Turbidity, Dissolved solids.
Identifiers: *Colonization, *Logs, *Kaskaskia River, Riffles, Water mites, Planarians, Substrates, Chironomids, Black flies, Populus deltoides, Ulmus americana, Acer saccharinum, Fraxinus americana, American elm, Silver maple, White ash, Aeolosoma, Ostracods, Seed shrimp, Platyhelminthes, Glochidia, Pond snails, Oedogonium, Melosira, Navicula, Cyclotella, Spirogyra, Closterium, Pleurosigma, Turbellaria, Macronycus glabratus, Atrichopogon fusculus, Pleurocerca, Hemiptera, Water striders.

Development of invertebrate communities on log substrates was investigated in three habitats. In slowly moving, shallow water, standing crops (weights) of colonizing invertebrates followed a sigmoid growth curve during a 6-week exposure period. Initial colonization was rapid, followed by 2 weeks of slow growth, a rapid increase during the next 2 weeks, and then a leveling off at 1,650 mg/sq m during the final week. Numbers followed a similar pattern of growth, attaining a high of approximately 100,000/sq m by the end of the 5th week. Chironomid larvae colonized first and in the greatest numbers, followed sequentially by sessile rotifers and oligochaetes. These three organisms had the greatest influence on standing crops and total numbers. In a riffle, colonization was also rapid: 569 mg and 8,830 individuals per sq m at the end of four weeks. The riffle community was dominated by Taeniopteryx nivalis, hydropsychid larvae, chironomid larvae, and simuliid larvae. In a pool, the standing crop was largest on logs at an intermediate depth, next largest near the surface, and smallest near the bottom. The oligochaete, Aeolosoma sp., attained their largest population on logs at the greatest depth, while chironomid larvae and taeniopterygid naiads attained their largest populations at or above the intermediate depth. Communities on naturally occurring logs contained more planaria and insects of the families Hydropsychidae, Heptageniidae, and Elmidae than on the experimental logs in slowly moving, shallow water. Communities on the introduced logs did not reach a climax stage during the experimental period because organisms, organic detritus, and silt were constantly accumulating or sloughing off, the substrate was slowly decomposing, and changes were occurring seasonally in the chemical and physical condition of the water, all of which modified the habitat and influenced community development. (Holoman-Battelle)
W73-13508

ENERGY FLOW IN A WOODLAND STREAM ECOSYSTEM: II. THE TAXONOMIC COMPOSITION AND PHENOLOGY OF THE CHIRONOMIDAE AS DETERMINED BY THE COLLECTION OF PUPAL EXUVIAE,
Pittsburgh Univ., Pa. Pymatuning Lab. of Ecology.
W. P. Coffman.
Archiv fur Hydrobiologie, Vol 71, No 3, p 281-322, March 1973. 11 fig, 6 tab, 45 ref.

Descriptors: *Life cycles, *Systematics, *Phenology, *Biorhythms, *Pennsylvania, *Midges, Biological communities, Invertebrates, Benthic fauna, Aquatic insects, Life history studies, Growth stages, Period of growth, Energy conversion, Diptera, Aquatic drift, Sampling, Water temperature.
Identifiers: *Linesville Creek, Species diversity, Macroinvertebrates, Drift organisms, Flies, Emergence, Acricotopus, Brillia cf. brevinervis, Cardiocladius, Corynoneura, Cricotopus spp, Corynoneura-Thienemanniella, Diplocladius, Epoicocladius, Eukiefferiella (Akiefferiella spp, Eukiefferiella brevicalcar, Eukiefferiella discoloripes, Heleniella, Eukiefferiella lobifera, Eukiefferiella spp, Heterotrissocladius spp, Krenosmittia cf. camptophleps, Limnophyes, Metriocnemus, Microcricotopus spp.

The taxonomic composition and phenology of the chironomid community of a small woodland stream in eastern Northern America were investigated by the utilization of natural collections of surface drifting pupal exuviae. Based on pupal identifications 143 chironomid taxa were recognized: Orthocladinae (83), Chironomini (25), Tanytarsini (21) and Tanypodinae (14). A total of 34 patterns of emergence were summarized in six major and three minor types. Almost all Orthocladiinae species had an emergence period in the late winter to mid-spring months. The other major taxa generally appeared later with the Chironomini and Tanypodinae being the most extreme. The onset of the emergence of the major taxa coincided sharply with the spring water temperature increase, the attainment of the maximum summer temperature and the period of maximum diel temperature fluctuation. Preliminary experiments on the decomposition of exuviae indicate that they remain floating for about two days. The quantification of the collecting method is discussed in conjunction with its possible use in benthic production studies. A short review of recently published work on the chironomid pupal life stage is included. (See also W71-10064). (Little-Battelle)
W73-13509

IDENTIFICATION BY MEANS OF RETENTION PARAMETERS,
Max-Planck-Institut fur Kohlenforschung, Muelheim an der Ruhr (West Germany).
For primary bibliographic entry see Field 05A.
W73-13511

THE SIGNIFICANCE OF HYDROCARBON ASSIMILATION IN YEAST IDENTIFICATION,
Technische Hogeschool, Delft (Netherlands). Lab. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-13512

DIFFERENTIATION OF MYCOBACTERIUM TUBERCULOSIS FROM OTHER MYCOBACTERIA BY SUSCEPTIBILITY TO ETHYL AND METHYL ESTERS OF P-NITROBENZOIC ACID,
Chubu Chest Hospital, Obu (Japan).
M. Tsukamura.
Japanese Journal of Microbiology, Vol 17, No 1, p 81-82, January 1973. 1 tab, 4 ref.

Descriptors: *Separation techniques, *Cultures, *Mycobacterium, Pathogenic bacteria, Growth rates, Inhibitors, Resistance.
Identifiers: *Nitrobenzoate, Culture media, p-Nitrobenzoate acid ethyl ester, Nitrobenzoate acid methyl ester, Mycobacterium spp.

Studies have shown that p-nitrobenzoate is useful in screening for atypical mycobacteria (other than tubercle bacilli). Since p-nitrobenzoate is not commercially available the present study was conducted to find commercial chemicals to serve the same purpose. The chemicals studied were the ethyl and methyl esters of p-nitrobenzoate. Twenty-two species of mycobacteria were cultured in Ogawa egg medium containing one of the two compounds in concentrations of 0.25 or 0.5 mg/ml. Almost all mycobacteria except Mycobacterium tuberculosis and Mycobacterium bovis were resistant to the compounds. Mycobacterium bovis was able to grow on the medium containing 0.25 mg/ml of either compound whereas Mycobacterium tuberculosis usually was not. Using a medium containing 0.25 mg/ml ethyl ester of p-nitrobenzoate, 26 strains of a typical mycobacteria other than Mycobacterium tuberculosis were detected from a total of 370 unknown mycobacteria. (Little-Battelle)
W73-13513

CONSERVATION OF THE GREAT LAKES OF EAST AFRICA: A LESSON AND A WARNING,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 02H.
W73-13517

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESHWATER ALGAE: AN EXPERIMENTAL STUDY. I. INTRODUCTION AND THE INFLUENCE OF CALCIUM CONCENTRATION,
Michigan State Univ., East Lansing. Dept. of Botany.
B. Moss.
Journal of Ecology, Vol 60, No 3, p 917-932, November 1972. 3 fig, 7 tab, 109 ref. OWRR A-034-MICH (2).

Descriptors: *Distribution patterns, *Trophic level, *Chlorophyta, *Chrysophyta, *Pyrrophyta, *Euglenophyta, *Cyanophyta, *Nutrient requirements, Bioassay, Reviews, Calcium, Cultures, Hardness (Water), Growth rates, Limiting factors, Alkalinity, Water quality.
Identifiers: Culture media, Cryptomonads, Bacillaria, Closterium acerosum, Cosmarium, Desmidium swartzii, Gonatozygon monotaenium, Mesotaenium kramstai, Micrasterias spp, Pleurotaenium trabecula, Roya anglica, Haematococcus droebakensis, Pleodorina californica, Pandorina morum, Volvox aureus, Pediastrum spp, Scenedesmus quadricauda, Eunotia, Synura petersenii, Peridinium, Zygnema spp, Chlamydomonas reinhardti, Ulothrix fimbriata, Nitzschia palea, Euglena gracilis, Trachelomonas grandis, Gloeocapsa, Gloeotrichia, Tolypothrix distorta var. sympiocides,

This study has attempted to establish factors affecting the distribution of algae in hard and soft waters through a study of the cultural requirements of algae of known distribution in these waters. The natural distributions of the species used in the experiments are described, and the effects of some major cations on growth are examined. Introducing a series of papers examining the reasons for the distribution of freshwater algae in eutrophic and oligotrophic water, this paper outlines the natural distribution of some of thirty-three species studies experimentally. Two groups of species are objectively delineated, one (oligotrophic) whose members are restricted to waters with not more than 1.5 m-equiv/l weak acid salts (Bicarbonate), the other (eutrophic) with members present in waters with 0-4 or more m-equiv/l weak acid salts. The ratio of monovalent to divalent cations did not affect growth of five test species. High calcium levels (100 mg/l) did not reduce growth of oligotrophic desmids, and 1.0 mg Ca (2 plus)/l was adequate for maximum growth of sixteen species tested. Two oligotrophic desmids required at least 1-3 mg Ca (2 plus)/l for maximum growth. No evidence was found for the contention that oligotrophic desmids are calciphobic. (Little-Battelle)
W73-13546

THE SEASONAL CYCLE OF PHEOPIGMENTS IN LAKE ONTARIO WITH PARTICULAR EMPHASIS ON THE ROLE OF ZOOPLANKTON GRAZING,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
W. A. Glooschenko, J. E. Moore, and R. A. Vollenweider.
Limnol Oceanogr. Vol 17, No 4, p 597-605, 1972. Illus.
Identifiers: Biomass, Canada, Cycle, *Lake, Ontario, *Pheo-pigments, Phytoplankton, Pigments, Seasonal, *Zooplankton grazing.

The annual cycles of chlorophyll a, pheo-pigments, and zooplankton in Lake Ontario were studied on 32 stations during 13 cruises in 1970. Highest amounts of chlorophyll a were found in inshore waters. The seasonal cycle of phytoplankton biomass as measured by chlorophyll a showed three patterns: a unimodal distribution in the deeper waters which are last to warm up in late spring; a bimodal pattern, with spring and fall peaks, mainly along the central basin and north and south shores; a series of 3 pulses in nutrient-rich areas and in the warmer eastern region of the lake. Zooplankton biomass increased eastward in the direction of increasing heat content. Pheo-pigments were low during the spring increase of phytoplankton, but their amount relative to that of chlorophyll a was significantly correlated ($r \pm +0.896$) with zooplankton abundance. Highest pheo-pigments were found in the eastern basin of the lake. The need to correct chlorophyll a values for pheo-pigments is emphasized especially when zooplankton grazers are abundant.--Copyright 1973, Biological Abstracts, Inc.
W73-13572

CHANGES DURING FOUR YEARS IN THE AQUATIC MACROVEGETATION IN A FLAD IN NORTHERN STOCKHOLM ARCHIPELAGO,
Umea Univ. (Sweden). Dept. of Biology.
C. Lundegardh-Ericson.
Sven Bot Tidskr. Vol 66, No 3, p 207-225. 1972. Illus.
Identifiers: *Aquatic plants, Ceratophyllum demersum, Chara tomentosa, *Flad, Myriophyllum spicatum, Najas marina, Oxygen, Phosphorus, Phragmites communis, *Sweden (Stockholm Archipelago), Vegetation, Bays, Hydrogen ion concentration.

Aquatic macrovegetation was studied and mapped in a shallow sheltered bay (sw. flad) in northern Stockholm Archipelago, central Sweden, during the years 1966-1969. The flad is surrounded by a thick girdle of mostly Phragmites communis. The submerged vegetation is characterized by large meadows of Chara tomentosa and Najas marina. During the first 3 yr it also consisted of luxuriant stands of Myriophyllum spicatum and Ceratophyllum demersum. The bottom consists of gyttja, with the exception of a small area near the southern shore. The distribution and changes of 16 aquatic species are discussed, together with water analyses of pH, oxygen, and total-P.--Copyright 1973, Biological Abstracts, Inc.
W73-13580

THE EFFECT OF THE WATER FACTOR IN SPREADING INTESTINAL INFECTIONS, (IN RUSSIAN),
P. G. Chumalo, and V. S. Kitel'.
Zh Mikrobiol Epidemiol Immunobiol. Vol 49, No 2, p 143-144. 1972.
Identifiers: Human infections, *Intestinal infections, Microorganisms, USSR, *Etiological factors.

The etiological factors and the possible effect on the spread of water borne diseases in the Western region of the river Bug are described. Based on data obtained from a sanitary-epidemiological station of the region, the various outbreaks of the disease were linked with the water of the river Bug and its tributaries. The chemical composition of water, the distribution of the disease in various age groups and certain sanitary recommendations for the future are presented.--Copyright 1973, Biological Abstracts, Inc.
W73-13583

ASPINA TRIUM GALLIENI N. SP. (MONOGENA, POLYOPISTHOCOTYLEA) PARASITE OF STRONGYLURA ACUS LACEPEDE 1803, (IN FRENCH),
Montpellier Univ. (France). Laboratoire de Parasitologie Comparee.ocotylea) Parasite of Strongylura Acus Lacepede 1803, (In French),
For primary bibliographic entry see Field 02I.
W73-13590

OXIDATION REDUCTION POTENTIALS, OXYGEN CONCENTRATION AND OXYGEN UPTAKE OF PROFUNDAL SEDIMENTS IN A EUTROPHIC LAKE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
B. T. Hargrave.
Oikos. Vol 23, No 2, p 167-177. 1972. Illus.
Identifiers: *Denmark (Lake Esrom), *Eutrophic lakes, *Oxidation, Oxygen, *Sediments (Profundal), Oxidation reduction.

Oxidation-reduction potentials were measured with a 1-mm platinum electrode in undisturbed sediment cores and re-settled mud from Lake Esrom, Denmark. Slow stabilization of Eh potentials occurred at the aerobic-anaerobic interface. Seasonal changes in Eh profiles in profundal sediments only occurred in the upper 1 cm during summer stratification. When O2 disappeared, reducing conditions reached the sediment surface. In artificial mud-water systems, no measurable O2 occurred when Eh values in either sediment, or water or both, fell below + 100 mv. O2 uptake by mud taken from various depths of sediment cores was inversely related to Eh potential. Eh and the square root of O2 uptake by sub-surface mud dur-

aeration showed a similar inverse proportionality, suggesting that intensity and capacity of consumption are related. Formalin addition uced O2 uptake by sediment from the surface undisturbed cores by 80%. Below 1 cm all O2 s consumed by chemical processes. Eh potenmay index both the intensity and capacity of h relations.--Copyright 1973, Biological Abacts, Inc.
3-13599

FECTS ON CATTLE OF WATER CONTAING DETERGENTS,
iversidad Nacional Autonoma de Mexico, Mex- City. Facultad Medicina.
V. Hornedo, and Alberto Stephano.
(Mex City). Vol 2, No 1, p 2-42, 1971.
ntifiers: Alkyl benzene sulfonate, *Cattle, *Degents, Lauryl, *Mexico, Sulfonates, Water polon effects.

usehold washing detergents are extensively d in Mexico and later appear in waste water, in ch they are extremely persistent. The most mmon detergents are alkyl benzene sulfonates BS) and alkyl lauryl sulfonate (ALS). Data are sented showing the effects on blood, feces, ie and animal weight. No particular effects re noted.--Copyright 1973, Biological Abacts, Inc.
3-13602

EDATION ON LARGEMOUTH BASS EMBOS BY THE POND SNAIL VIVIPARUS ORGIANUS,
her Coll., Decorah, Iowa. Dept. of Biology.
V. Eckblad, and M. H. Shealy, Jr.
ns Am Fish Soc. Vol 101, No 4, p 734-738, 2. Illus.
ntifiers: *Bass embryos, Largemouth bass, cropterus-salmoides, Ponds, *Snail predation, iparus-georgianus, Spawning.

dation by this snail may contribute to the high rtality of largemouth bass embryos (Micropus salmoides) in bass spawning areas when this il is abundant.--Copyright 1973, Biological Abacts, Inc.
3-13603

RASITE FAUNA OF DIFFERENT FORMS OF E ARCTIC CHAR, SALVELINUS ALPINUS FROM KAMCHATKA, (IN RUSSIAN),
ademiya Nauk SSSR, Vladivostok. Institut rskogo Biologii.
T. Makhovenko.
azitologiya. Vol 6, No 4, p 369-375, 1972. Enh summary.
ntifiers: *Arctic char, Ecological studies, *Fauparasite, Forms, *Kamchatka (USSR), asites, Salvelinus-alpinus, USSR.

ır freshwater forms and 1 anadromous form of Arctic char were recorded from Lake abachye (Kamchatka) (USSR). The forms init different ecological niches and differ in their asite fauna. Certain parasites can be used as inators of these forms. Further investigations in field will provide an elaboration of a new thod for differentiation of the Arctic char forms means of parasite indicators.--Copyright 1973, logical Abstracts, Inc.
3-13611

ASUREMENTS OF MICROALGAL PRIMAPRODUCTION (PHYTOPLANKTON AND CROBENTHOS) IN THE SMALANDSHAVET ENMARK),
ddevandsudvalget, Soborg (Denmark).
Gargas.
nelia. Vol 10, No 1, p 75-89, 1972. Illus.
ntifiers: Algal, *Benthos, *Denmark (Smadshavet), Measurement, *Phytoplankton, *Primary production, Waste waters, Dissolved oxygen.

Measurements of the production of organic matter by the microalgae (phytoplankton and microbenthos) have been carried out in the Smalandshavet-a shallow water area in the southern part of Denmark. Measurements of dissolved O2 and the vertical penetration of the green light were also made. The area investigated can be divided into 2 parts, and open area with a good exchange of water and an enclosed fjord with poor possibilities of water renewal. Both areas are recipients for loaded waste waters. None of the areas investigated had high microalgal production. The ineffective water exchange in the fjord makes the watermass very sensitive to larger amounts of O2-consuming substances. Because of outlet of sewage the concentration of dissolved O2 is low and the turbidity high. This restricts biological diversity. Calculations show that the O2 deficit observed is mainly due to loaded O2-consuming substances. The decomposition of in situ produced organic matter is of less importance.--Copyright 1973, Biological Abstracts, Inc.
W73-13612

CHARACTERISTICS OF DIATOMS OF PRESENT-DAY GLACIAL LAKES OF THE POLAR URALS,
For primary bibliographic entry see Field 02H.
W73-13613

CHLOROPHYLL CONTENT AND PRIMARY PRODUCTION OF SESSILE ALGAL COMMUNITY IN MOUNTAIN STREAM CHIGONOZAWA RUNNING CLOSE TO KISO BIOLOGICAL STATION OF THE KYOTO UNIVERSITY,
Tokyo Univ. of Education (Japan). Dept. of Botany.
H. Kobayasi.
Mem Fac Sci Kyoto Univ Ser Biol. Vol 5 No 2, p 89-107, 1972. Illus.
Identifiers: Algae, Biological studies, Chigonozawa, *Chlorophyll, *Japan, Light, Mountain stream, Photosynthesis, *Primary production, Respiration, Running, *Sessile algae, Streams.

The chlorophyll standing crops and the photosynthesis-light intensity curves of the sessile algal communities, together with the light condition in the environments (measured with celestial photographs), were measured during 1964-1966 in the stream Chigonozawa (Japan), flowing in the montane region of central Japan. Algal communities were mainly composed of blue-greens and diatoms. A linear correlation between light condition and chlorophyll content was found. The annual mean value of chlorophyll content was 0.030 g/m2 and the annual gross production was estimated to be 0.13 kg . glucose/m2. Average annual values for the whole water course for total sum of the gross production, the amount of respiration and the net production were 86.45 kg . glucose, 53.68 kg . glucose and 32.78 kg . glucose, respectively. The photosynthesis-light intensity curve was a shade-type one with marked photo-inhibition both in summer and autumn (Ik was ca. 3200 lux).--Copyright 1973, Biological Abstracts, Inc.
W73-13614

NATURE OF THE BOTTOM AND DISTRIBUTION OF BENTHIC ORGANISMS IN THE BOL REGION (EASTERN ARCHIPELAGO OF LAKE CHAD),
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
For primary bibliographic entry see Field 02H.
W73-13618

PARASITES OF COMMON FISHES FROM IRAQ WITH SPECIAL REFERENCE TO LARVAL FORM OF CONTRACAECUM (NEMATODA:HETEROCHEILIDAE),
Biological Research Centre, Baghdad (Iraq).
M. Shamsuddin, I. A. Nader, and M. J. Al-Azzawi.
Bull Biol Res Cent (Baghdad). No 5, p 66-78, 1971. Illus.
Identifiers: Barbus-esocinus, Contracaecum, Fish parasites, Gill, *Heterocheilidae, Ichthyopthirius-sp, *Iraq, Larva mugil-abu, *Nematoda, Parasites, Pathology, Piscicola-sp, Silurus-triostegus, Trichodina-sp.

A total of 47 fishes belonging to 3 families, Cyprinidae, Siluridae and Mugilidae, were examined for various parasites. Protozoan parasites such as Ichthyopthirius sp. were rarely found but Trichodina sp. was commonly recovered from all fishes. Protozoan blood parasites were not seen and the fishes were nearly negative for parasites of the groups Acanthocephala, Hirudinea and Crustacea. Two species of the genus Barbus, however, suffered heavy gill-infection with Piscicola sp. during late spring and summer only. Larval cestodes were recovered only in 1 instance from B. esocinus and mature cestodes were obtained once from Silurus triostegus. In general, larval nematodes were found in most fishes but S. triostegus and Mugil abu suffered heavily. Notes on the larval nematodes, their seasonal variation, effects on fishes and biology and identification of Contracaecum are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-13620

STUDY OF THE BIOLOGY OF PELOPIA PUNCTIPENNIS MG. (CHIRONOMIDAE, DIPTERA) IN THE MINGECHAUR RESERVOIR (IN RUSSIAN),
For primary bibliographic entry see Field 02H.
W73-13621

EXPERIMENTAL INFORMATION FOR SUBSTANTIATING THE MAXIMAL PERMISSIBLE CONCENTRATION OF ISOPROPYLBENZOL HYDROGEN PEROXIDE IN BODIES OF WATER (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 05B.
W73-13623

A NEW NEMATODE SPECIES IN CARP WATERS OF THE WEST REGIONS OF UKRAINE,
Zooveterynarnyi Instytut, Lvov (USSR).
V. M. Ivasik, B. G. Svirepo, R. V. Skovronskii, and N. I. Vorona.
Helminthologia (Bratisl). 10, p 181-183, 1969 (1971).
Identifiers: *Carp, Cyclops-coronatus, *Nematode, Philometra-lusiana, Species, *Ukraine, USSR.

Philometra lusiana Vismans, which causes philometrosis in carp, was first observed in 1960 in Latvia, and in recent years has infected carp in the western regions of the Ukraine. Fish are affected in June, and the length of the life cycle is about 1 year. In order to study the biology of this parasite, helminth larvae obtained from female animals were incubated at 20 degrees with Cyclops coronatus, and were observed every 2-3 days. By the 6th day they became less mobile; on the 11th day 70% of the larvae died; and on the 14th day 100%. Research showed that fish were affected after eating an intermediary host (e.g., C. coronatus) infested with P. lusiana larvae. Other intermediate hosts were found. Effective measures for combatting philometrosis in carp have not yet been developed.--Copyright 1973, Biological Abstracts, Inc.
W73-13624

SANGUINICOLOSIS IN CARP IN THE WINTER,
Zooveterynarnyi Instytut, Lvov (USSR).
V. M. Ivasik, and B. G. Svirepo.
Helminthologia (Bratisl), 10, p 103-105, 1969 (1971).
Identifiers: *Carp, Chilodonella-cyprini, Dactylogyrus-anchoratus, Dactylogyrus-extensus, Lymnaea, Myxobolus-dispar, Radix, *Sanguinicola-inermis, Sanguinicolosis, Trichodina-pediculus, USSR, Valvata, Winter.

The agent for sanguinicolosis in carp--Sanguinicola inermis Plehn, 1905, is encountered in many parts of the USSR, including the western regions. The development of the parasite is complex, involving molluscs (Lymnaea, Radix, Valvata) as an intermediate host. Outbreaks of sanguinicolosis were observed most frequently in June, July, and less frequently in August. The parasite produces eggs from May-Nov. The number of adult parasites in gills of 1 fish was 3-120; in the heart, 1-10. Observations made in Feb., 1965 revealed that fish were infested to some extent by the following parasites: Myxobolus dispar, Trichodina pediculus, Chilodonella cyprini, Dactylogyrus anchoratus, Dactylogyrus extensus. During sanguinicolosis, Hb was reduced by 20% in mild cases and 61% in serious cases. In mild cases serum protein was 69.6% lower; albumin and beta-globulin decreased. In serious cases, alpha-globulin increased. In the winter period, sanguinicolosis in carp lead to significant physiological changes. In order to combat this disease, the cycle of parasite development must be broken by eliminating the mollusc intermediate host and also by periodic summering in streams.--Copyright 1973, Biological Abstracts, Inc.
W73-13625

NATURAL TULAREMIA FOCI STRUCTURE IN THE FLOODLANDS OF SMALL AND MEDIUM RIVERS. II. EPIZOOTOLOGIC NATURE OF ELEMENTARY FOCI (IN RUSSIAN),
V. L. Adamovich.
Zh Mikrobiol Epidemiol Immunobiol, Vol 48, No 10, p 108-113, 1971, Illus, English summary.
Identifiers: Arvicola-terrestris, *Epizootologic studies, *Floodlands, Insects, Rivers, *Tularemia foci, *Diesna River (USSR).

Elementary tularemia foci localized in terraces over the flood-lands of Diesna river resemble the forest, premountain-spring and forest-swamp foci. Biocenoses of the meadow flood-land convert the splashes of the infection from the elementary foci into a flood-land focus. The name valley-river focus is suggested for a flood-land focus on Diesna; epizootologic significance of such focus is associated not with the population of Arvicola terrestris L. and water regimen, as large rivers, but is determined by complicated processes of fluctuation of the infection on the terrace slopes. Epidemiologic prognosis should proceed not from the population of A. terrestris L., but from the general epizootic situation in the river valley, intensity of flight of blood-sucking insects and immunity in the human population.--Copyright 1973, Biological Abstracts, Inc.
W73-13628

MATERIALS FOR HYGIENIC ASSESSMENT OF SALT COMPOSITION IN DRINKING WATER: VI. EFFECT OF CONSUMPTION OF MAGNESIUM SALTS WITH DRINKING WATER ON OSSIFICATION PROCESSES IN GROWING ANIMALS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Zheleznodorozhnoi Gigieny, Moscow (USSR).
I. S. Kandror, K. G. Basmadhzieva-Tancheva, and A. Tomov.
J Hyg Epidemiol Microbiol Immunol (Prague), Vol 15, No 4, p 462-468, 1971.
Identifiers: Hygienic studies, *Magnesium salts, *Ossification, Osteoporosis, Rats, *Salt, X-Ray, *Potable water.

Experiments were performed on white rats of the Wistar line which consumed drinking water with Mg salt concentration of 100 and 500 mg/l. The animals were maintained on a balanced diet. The content of Mg in the bone ashes increased 2-4 times as compared with the control animals (10 mg/l) at a certain decrease of Ca content. At a concentration of 500 mg/l, the Ca content in bone ashes decreased to 1/3. X-ray examination of tubular bones demonstrated moderate osteoporosis of Ca deficiency type in the metaphyses. Drinking water containing Mg salts in excess (100 and 500 mg/l) may compensate lack of Mg in food products. In general, an excess of Mg salts in the ration did not necessarily cause all excessive Mg to be eliminated from the organism. A part of it was deposited in the bone tissue replacing Ca in hydroxyapatite crystals and led to the manifestations of osteoporosis. The data yield a basis for the determination of the norm of Mg salt content in drinking waters in the international standard of drinking water quality.--Copyright 1973, Biological Abstracts, Inc.
W73-13630

INTESTINAL INFECTION CARRIER SURVEY IN DIYARBAKIR: I. (IN TURKISH),
C. Yumul, and O. Gulesen.
Mikrobiyol Bul, Vol 6, No 2, p 199-204, 1972, English summary.
Identifiers: Escherichia-coli, Human infection, *Intestinal infection, Klebsiella, Salmonella, Shigella, Survey, *Turkey (Diyarbakir), Vibrio-cholerae, *Bacteria.

There was an increase in the rate of intestinal infections, in Diyarbakir, Turkey, during the autumn months of 1971. A carrier survey was made. Samples of feces were taken from 273 soldiers of the regional gendarmerie unit. Four carriers (2 Shigella and 2 Salmonella) were found and treated. ehere was no Vibrio cholerae carrier. The gendarmerie unit was quartered near a spring, and the water from the spring was used. Samples of spring water were examined bacteriologically. Escherichia coli and Klebsiella were found in the water samples. Advice was given to chlorinate the water. In organized communities, there might be intestinal infection carriers in significant numbers.--Copyright 1973, Biological Abstracts, Inc.
W73-13631

STUDY OF PARASITES IN FISHES OF THE SIND RIVER: I. TREMATODES OF HILSA ILISHA (HAM.),
Government Coll., Tando Muhammad Khan (Pakistan).
S. S. H. Rizvi.
Sind Univ Res J Sci Ser, Vol 5, No 2, p 189-200, 1971, Illus.
Identifiers: Aphanurus-monolecithus, Faustula-hilsai, *Fish parasites, *Hilsa-ilisha, Lecithaster-indicus, *Pakistan (Sind River), Parasites, Rivers, Species, *Trematodes.

Hilsa ilisha, a food fish of Sind (Pakistan), was examined. Three species of trematodes, 4 of cestodes and 1 of Acanthocephala were found to infect the host. The trematode species Aphanurus monolecithus and Lecithaster indicus are redescribed. Faustula hilsai is described and figured.--Copyright 1973, Biological Abstracts, Inc.
W73-13634

5D. Waste Treatment Processes

COST OF WASTE WATER POLLUTION ABATEMENT IN POULTRY PROCESSING AND RENDERING PLANTS IN GEORGIA,
Georgia Univ., Athens. Dept. of Agricultural Economics.
W. R. Kerns, and F. J. Holemo.

Available from the National Technical Informa tion Service as PB 222 506, $3.00 in paper copy $1.45 in microfiche. Environmental Resource Center, Georgia Institute of Technology, Atlanta Report ERC-0673, June, 1973. 39 p, 18 tab, 11 re OWRR A-038-GA (1) 14-31-0001-3810

Descriptors: Water pollution control, *Poultry *Industrial wastes, Economic impacts, Environ mental effects, Waste disposal, Food processin industry, *Georgia, *Treatment facilities, *Was treatment, Waste water treatment.
Identifiers: *Poultry processing wastes, Renderin Plants.

Information on pollution control practices was o tained from 26 poultry processing plants and nin by-products plants in Georgia. Data were obtaine on plant size and type of operation, approaches waste treatment, expenditures, degree of enviro mental control achieved, and the disposition of b products. Each plant can balance the cost process changes to reduce waste generation wi the cost of waste treatment. Plants with access to public sewerage service can balance sew changes against their other costs. The industry making substantial expenditure of all three kind Processing plants are spending an average $10,800 annually for waste reduction and was treatment equipment, an amount equal to $0.88 p 1,000 birds processed. Average annual operati and maintenance expenses (for both types equipment plus service charges) are $16,900 p plant and $1.35 per 1,000 birds processed. Es mates were also made of the cost of utilizing t best available control technology. For plants e ploying their own treatment systems, it was es mated that annual equipment expenditures wou increase by a factor of 3.2 and that operation a maintenance expenditures would increase by factor of 5.8. The initial expenditure for n equipment could run as high as $23 per 1,000 bi processed. Public service charges could triple c rent rates. Most plants indicated that current tre ment expenses have had little effect on produ prices and profits; however, both may be affect as higher water quality standards require more a vanced pollution control technology. (James-Ge gia)
W73-13003

STUDY OF GAMMA INDUCED LOW TE PERATURE OXIDATION OF TEXTILE E FLUEHNTS,
Oak Ridge National Lab., Tenn. Isotop Development Center.
F. N. Case, and E. E. Ketchen.
Copy available from GPO Sup Doc EP1.23/2:73-260, $0.90; microfiche from NTIS PB-222 621, $1.45. Environmental Protecti Agency, Technology Series Report EPA-R2-260, May 1973. 60 p, 9 fig, 27 tab, 6 ref. EPA P ject 12090 FWD.

Descriptors: Color, *Oxidation, *Chemical ygen demand, *Gamma rays, Radiation, *P wastes, Dyes, *Waste water treatment.
Identifiers: *Color removal, Textile effluen *Charcoal reactivation.

Gamma irradiation of textile mill effluents un oxygen pressures up to 1500 psi, with and with activated charcoal present, was studied as method for removing color and removal of s stances contributing to the chemical oxygen mand (COD). Both color and COD reduction directly related to the radiation dose and press of the oxygen over the dye solution samples dur irradiation. Color removal was achieved in so tions of dye prepared in the laboratory for proc evaluation and for authentic textile mill waste fluents; however, the variation in the radiat dose required for various dye compounds large. The study revealed a new method for in- reactivation of charcoal by gamma-radiation duced oxidation of organic compounds adsor

on charcoal. This discovery permits a large reduction in the gamma source size required for processing textile mill effluents because the water fraction of the effluent does not need to be irradiated to the same degree as the organic material contained in the effluent. A mathematical model for the process, developed late in this study, has not yet been experimentally verified. (EPA)
W73-13022

UPTAKE OF MERCURY BY YEAST CELLS,
Cornell Univ., Ithaca, N.Y.
A. Ramalingam.
M Sc Thesis, January 1973. 59 p, 17 fig, 13 tab, 15 ref. OWRR-A-039-NY (2).

Descriptors: *Mercury, *Waste water treatment, *Yeasts, *Biological treatment, *Water pollution treatment, Water pollution control, Water treatment, Sorption, Magnesium, Iron, Operating costs.

Mercury uptake by yeast cells depleted in magnesium and/or iron was studied with a view to developing a biosorption process for removal of mercury. Mercury uptake was highly variable and no clear trend was observed with different media. Yeast absorbed mercury up to 1% of the dry cell weight. The mercury content of the cells increased as the mercury content of the contacting solution dropped from 20 ppm to 1 ppm. The fact that only a part of the mercury was reversibly bound suggests that more than one binding mechanism is operating. About 11.55 gm of yeast per liter of waste was necessary for reducing the mercury level from 60 ppm to 7 ppm. It is suggested that the process be combined with another treatment, for example, ion exchange, for economic operation. The operating costs would be rather high, amounting to about $20.00 per 1000 gallons for a plant to treat 15,000 gallons per day. (Knapp-USGS)
W73-13030

SECONDARY SEWAGE TREATMENT IN PIPELINE CONTACTORS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
W. F. Russell.
Canadian Journal of Chemical Engineering, Vol 50, p. 179-184. April 1972. OWRR-A-008-DEL (3).

Descriptors: *Sewage treatment, Pipelines, *Oxygenation, Mathematical models, *Waste water treatment, *Sewage, Design, Tubes.

The preliminary design steps for a secondary sewage treatment process are discussed in a case study format. A tubular contactor with an oxygenator and reactor section is proposed as an alternate design to the conventional open tank process.
W73-13077

FEASIBILITY OF USING PULP MILL SLUDGE AS AN ADDITIVE TO CORRUGATING MEDIUM,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 05E.
W73-13081

NITRIFICATION AND DENITRIFICATION - A SELECTED BIBLIOGRAPHY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05B.
W73-13085

ACTIVATED SLUDGE MODIFICATIONS FOR ENHANCEMENT OF TRICKLING FILTER PLANT PERFORMANCE. I. DESIGN, OPERATION, AND BOD REMOVAL IN THE UNITS. II. NITRIFICATION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. E. Francisco, L. W. Little, and J. C. Lamb, III.
UNC Wastewater Research Center Report No 18, April 1971. 43 p, 10 fig, 6 tab, 24 ref. EPA Project 11010 DGA. 14-12-505.

Descriptors: *Waste water treatment, *Treatment facilities, *Trickling filters, Filtration, Design, Operations, *Activated sludge, *Nitrification, *Biochemical oxygen demand.

Enhancement of trickling filter plant performance by subsequent activated sludge treatment was investigated. Five activated sludge pilot plants, each consisting of aeration tank and settling tank with air lift sludge return, were fed trickling filter effluent at a constant rate (300 ml/min). Hydraulic detention times in the aeration units were 0.4, 1.7, 4.0 and 9.2 hrs. Temperature was maintained at 25C. Effects of pH control, sludge wasting, and detention time were evaluated. Results indicated that activated sludge treatment substantially increased overall BOD, COD, organic carbon, and MBAS removals. At detention times of at least 1 hr significant nitrification was achieved. Control of pH with NaHCO3 improved nitrification efficiency; however, substantial nitrification was achieved at pH levels below 7. Control of wasting and of return sludge was necessary for optimum BOD, COD, and organic carbon removals and for optimum nitrification.
W73-13086

VARIATIONS IN CHARACTERISTICS OF WASTEWATER INFLUENT AT THE MASON FARM WASTEWATER TREATMENT PLANT, CHAPEL HILL, NORTH CAROLINA,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
R. L. Hanson, W. C. Walker, and J. C. Brown.
UNC Wastewater Research Center Report No 13, December 1970. 47 p, 7 fig, 23 tab, 12 ref. EPA Project 11010 DGA. 14-12-505.

Descriptors: Waste water treatment, *Treatment facilities, *Waste identification, *North Carolina, *Domestic wastes, Waste water (Pollution), *Organic loading.
Identifiers: *Chapel Hill (N.C.).

Variations in characteristics of wastewater from the Town of Chapel Hill (N.C.) were studied. Composite samples of domestic wastewater influent were collected at 2-hr intervals over 24-hr periods on each of the seven days of the week so that diurnal variations in flow and constituent concentrations and loadings could be observed. Samples were analyzed for BOD, COD, TOC, nitrogen, phosphorus, MBAS, and specific solids and metal constituents. Influent flow was found to vary from 30 to 144% of average with the maximum flow occuring between 1000-1200 hours and the minimum flow between 0400-0600 hours. Wastewater constituents showed a wide range of concentrations and loadings. Generally maximum concentrations and loadings occurred between 1000-1400 hours and the minimum values between 0600-0800 hours. The ratio of maximum to minimum concentrations for the constituents varied from 4-12 to one; for loadings, from 10-20 to one. (Little-North Carolina)
W73-13087

NITROGEN BALANCE IN SOIL COLUMNS INTERMITTENTLY FLOODED WITH SECONDARY SEWAGE EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 05B.
W73-13116

PROCESS DESIGN MANUAL FOR PHOSPHORUS REMOVAL,
Black and Veatch, Kansas City, Mo.

Available from the Environmental Protection Agency, Office of Water Programs, Technology Transfer, Washington, D.C., in microfiche from NTIS on PB-214 553 for $1.45. Environmental Protection Agency, Technology Transfer Manual, October 1971, 195 p. EPA Project 17010 GNP, Contract 14-12-936.

Descriptors: Phosphorus, *Chemical precipitation, Eutrophication, *Coagulation, *Flocculation, *Settling basins, *Filtration, *Mixing, Dewatering, Sludge treatment, Solids contact process, Tertiary treatment, Municipal wastes, *Waste water treatment.
Identifiers: *Phosphorus removal, Alum, Ferrous, Ferric, Lime treatment, Sodium aluminate, Pickle liquor, Dual media, Multimedia, Thickening.

The discharge of phosphorus-containing wastewaters into the surface waters of the United States has contributed to their over-fertilization and eutrophication. As a result, efforts are now being made to remove phosphorus from wastewater. This manual discusses phosphorus removal methods that have been found effective and practical for use at treatment plants. All the methods included involve chemical precipitation of the phosphorus and removal of the resultant precipitate. Precipitants include salts of aluminum and iron, and lime. The practical points of addition are before the primary settler, in the aerator of an activated sludge plant, before the final settler, or in a tertiary process. Included in the discussion of each treatment method is a description of the method, pilot or full-scale performance data, equipment requirements, design parameters, and costs. This information should be of value to designers, municipal officials, regulatory agencies, city planners, and treatment plant operators. (Brunner-EPA)
W73-13129

PROCESS DESIGN MANUAL FOR SUSPENDED SOLIDS REMOVAL.
Burns and Roe, Inc., Oradell, N.J.

Available from Technology Transfer, appropriate E.P.A. Regional Office; in microfiche from NTIS as PB-214 551 for $1.45. Environmental Protection Agency, Technology Transfer Manual, October 1971, 149 p. EPA Project 17030 GNO, Contract 14-12-930.

Descriptors: *Waste water treatment, *Treatment facilities, *Tertiary treatment, Chemical precipitation, Coagulation, Diatomaceous earth, Filtration, Flocculation, Flotation, Membrane processes, Settling basins, Solids contact process.
Identifiers: *Design considerations, *Operation requirements, *Cost estimates, Chemical feeding, High-rate settlers, Microscreening.

This manual comprises a compilation of information on the practice of suspended solids removal from municipal wastewaters. General engineering considerations are cited with respect to their impact on the design of treatment facilities. Specific processes utilized for suspended solids removal are described, discussed and illustrated through the use of data from installations which have employed these processes. Current technology and advanced methods of treatment are stressed in order to provide usable information for implementation in design of new treatment facilities. Some aspects of the operation and maintenance requirements of the described unit processes are delineated, along with the overall estimated costs of construction and operation. The information and data provided are presented in such a manner that they can be readily incorporated into practice. (Kreissl-EPA)
W73-13130

PROCESS DESIGN MANUAL FOR CARBON ADSORPTION.
CH2M/Hill, Corvallis, Oreg.

Available from Environmental Protection Agency, Regional Offices, Technology Transfer; in microfiche from NTIS as PB-214 552 for $1.45. Environmental Protection Agency, Technology Transfer Manual, October 1973, 195 p. EPA Project 17020 GNR.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated carbon, Adsorption, Biodegradation, Dewatering, Filtration, Tertiary treatment.
Identifiers: *Carbon regeneration, *Design parameters, Cost estimates, Operation requirements, Organic removal, Physical-chemical treatment.

Activated carbon adsorbs a great variety of dissolved organic materials found in wastewater, including many which are resistant to biodegradation in conventional biological wastewater treatment plants. Carbon's great efficiency in organic removal has promoted its use for upgrading conventional plant performance. Successful use of carbon in tertiary treatment has led to proposals that it be used for secondary treatment as well, i.e., as a replacement for biological treatment. In the latter instance, activated carbon would be used as one portion of a larger physical-chemical treatment plant. This manual, a revision of the 1971 manual by Swindell-Dressler Co., Pittsburgh, Penn., examines major design parameters and unit operations (including pretreatment) which are important in carbon adsorption systems. Existing carbon plant designs are evaluated. Costs are evaluated for the various unit operations. Various plant configurations are discussed. Carbon regeneration (a prerequisite for economic feasibility) is discussed and the necessary equipment is described. Other aspects discussed include: air pollution control devices for the regeneration furnace, personnel requirements, isotherm and pilot testing, carbon dewatering, biodegradation of organics in carbon columns. (EPA)
W73-13131

PROCESS DESIGN MANUAL FOR UPGRADING EXISTING WASTEWATER TREATMENT PLANTS.
Weston (Roy F.), Inc., West Chester, Pa.

Available from: EPA Regional Office Technology Transfer; in microfiche from NTIS as PB-214 550 for $1.45. Environmental Protection Agency, Technology Transfer Manual, October 1971, 275p. EPA Project 17090 GNQ, Contract 14-12-933.

Descriptors: *Waste water treatment, Optimization, *Treatment facilities, *Sewage treatment, *Biological treatment, *Performance, *Control systems, Activated sludge, Aeration, Associated costs, Centrifugation, Chemical precipitation, Design criteria, Disinfection, Filtration, Flocculations, Lagoons, Monitoring, Odor, Operation and maintenance, Organic loading, Oxygen requirements, Sampling, Separation techniques, Sludge digestion, Sludge treatment, Trickling filters, Water quality.
Identifiers: Chemical treatment, Physical treatment, Recirculation, Effluent polishing, Clarifiers, Contact stabilization, Step aerations, Oxygen aeration.

The main purposes of this manual are to examine situations that necessitate upgrading of existing municipal wastewater treatment plants and to discuss and evaluate the corrective actions that are required to upgrade these existing plants. Upgrading to overcome organic and hydraulic overloadings and/or to meet more stringent treatment requirements is considered. The information presented is specifically adapted to plants having capacities of less than 5 mgd. This particular capacity was selected because most of the existing municipal wastewater treatment plants in the United States have capacities of less than 5 mgd. The manual emphasizes that operational improvement and modifications to existing unit operations be considered as the logical initial approach to upgrading existing treatment plants, before major expansion of existing facilities is implemented. Because of the numerous alternatives available for upgrading an existing treatment plant, it is necessary to understand thoroughly the fundamentals of the various unit operations commonly used in municipal wastewater treatment plants. Therefore, this manual examines in depth the capabilities, limitations, and interrelationships of the various unit processes. The manual also examines hypothetical situations requiring upgrading of unit operations and describes 'order of magnitude' costs associated with the upgrading of various unit operations. One chapter of the manual presents case histories of upgrading of existing wastewater treatment plants to illustrate the approaches actually used in these circumstances. The operation and maintenance requirements of the upgraded treatment plants are also briefly examined in the manual. (EPA)
W73-13132

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
C. S. Shih, and J. K. Garner.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 801-830, (1972). 4 fig, 3 tab, 17 ref.

Descriptors: *Reliability, *Municipal water, River basins, Water quality control, *Optimization, *Management, Treatment facilities, Water pollution control, Environmental effects, Probability, Mathematical models, Systems analysis, Costs, *Regional analysis, Waste water treatment, *Texas, *Risks.
Identifiers: *San Antonio (Tex), Sensitivity analysis.

The endeavor to reduce the liability of pollution to urban water resources necessitates recognition of the probabilistic nature of the performance of pollution control facilities as well as environmental responses. There exists a great need to devise a methodology for the assessment of uncertainty of goal achievement and control parameters variation for river basin quality management. Reliability is defined herein as the measure of effectiveness for the attainment of water quality managerial goals. The concept of reliability of regional waste facilities is introduced. An optimization model is developed for the determination of the best pollution control policies for each treatment facility in terms of the minimization of total regional cost requirements, the quality control requirements, and the reliability desired. The variability of each treatment facility is characterized by a normally distributed random variable whereas the quality standard and reliability requirement is represented by a chance-constraint. Using the newly developed chance-constrained quadratic programming method coupled with parametric analysis, a solution approach for the model is devised. The effects of reliability on optimum managerial policies of urban water quality are illustrated by applying the developed model to the existing situation of San Antonio Area, Texas. Implications resulting from the sensitivity analysis of this model are also discussed. (See also W73-13134) (Bell-Cornell)
W73-13156

INORGANIC NITROGEN REMOVAL FROM WASTEWATER: EFFECT ON PHYTOPLANKTON GROWTH IN COASTAL MARINE WATERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-13179

SURVIVAL OF SALMONELLA TYPHIMURIUM IN ANIMAL MANURE DISPOSAL IN A MODEL OXIDATION DITCH,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 05C.
W73-13253

EFFECT OF WASTE WATER FROM THE ASTRAKHAN CELLULOSE-PASTEBOARD PLANT ON SOIL PROPERTIES,
V. S. Shumakov, and M. P. Popova.
Soviet Soil Science, Vol 4, No 5, p 577-587, 1972. 2 fig, 12 tab, 14 ref. Translated from Pochvovedeniye, No 10, p 99-109, 1972.

Descriptors: Waste water treatment, *Water reuse, *Industrial water, *Waste water disposal, *Irrigation effects, *Desalination, Irrigation, *Irrigation water, Irrigation ditches, Soil properties, Laboratory tests, Trees, Crop production, Soil types, Saline soils, Alkaline soils, Brown soils, Semiarid climates.
Identifiers: *USSR (Astrakhan), Poplar trees, Solonetzization.

Since waste water from cellulose-pasteboard plants cannot be discharged into natural bodies of water without preliminary treatment, the intermediate use of industrial waste water to irrigate various crops, as an additional resource, was studied. Field and simulated laboratory experiments were conducted using a mixture of industrial waste water from the Astrakhan Cellulose-Pasteboard Plant and domestic (Volga) water to irrigate poplar stands on Brown Desert-Steppe soils. During the first few years such use resulted in partial desalinization of the saline soils, but desalinization occurred more slowly than when the same soils were irrigated with Volga water. After irrigation with domestic-industrial waste water, desalinization of Brown Desert-Steppe soils of different textures resulted in a 33 to 92 percent increase in total alkalinity and a 5 to 16 percent increase in the degree of solonetzicity of the soils. The rate of solonetzization varied with soil texture, irrigation rate, and intake rate of irrigation water. Solonetzization in the surface layers of the irrigation furrows caused a sharp decrease in permeability. To improve the intake of irrigation water by poplars and to diminish the effects of solonetzization, temporary, rather than permanent, irrigation ditches or furrows should be used for a single growing season. (Gloyd-Arizona)
W73-13315

SOLID WASTE DISPOSAL AND WATER PURIFICATION METHOD AND APPARATUS,
Combustion Power Co., Inc., Palo Alto, Calif. (Assignee).
R. D. Smith, and D. A. Furlong.
U. S. Patent No 3,741,890, 9 p, 9 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1419, June 26, 1973.

Descriptors: *Patents, *Waste treatment, *Waste water treatment, Pollution abatement, Water quality control, Phosphates, Nitrogen, Lime, Suspended solids, Colloids, *Distillation, *Nutrient removal, *Domestic wastes, *Industrial wastes, Waste disposal.
Identifiers: Char, Combustion, Compression, Clarification, Sterilization, Pyrolysis.

The energy to operate this system is derived from the solid waste itself, the active char by-product of the pyrolysis of the waste being utilized to adsor contaminants from the waste water. Solid waste material is shredded and dried and then transferred to the pyrolyzer where waste is converted to hot fuel gas and char. The hot fuel gas is used to drive a gas turbine which generates all the power

ecessary to operate the system. Heat obtained
om exhaust of the turbine assembly is used in
ying the incoming waste material, and a com-
essor driving by the turbine supplies compressed
r to a char combustion chamber. A portion of the
ar is removed from the pyrolyzer and mixed
ith incoming waste water to remove contami-
nts therefrom by adsorption. After adsorption
the contaminants, a portion of the char is
moved from the water and recirculated back in
e pyrolyzer. Water partially decontaminated
rough adsorption by char, is clarified with lime
ken from ash generated in the combustion of the
ry same char. Lime clarification serves to
move from the water the supra-colloidal and col-
idal suspended solids, the colloidal size char par-
les and the phosphates. Calcium carbonate
ecipitated during clarification can then be
turned to the pyrolizer. Heat and power
nerated in the system can be used to distill and
erilize the partially treated waste water to make
otable. (Sinha-OEIS)
73-13320

**REENING AND AERATING CONCENTRA-
OR,**
veco, Inc., Los Angeles, Calif. (Assignee).
P. Miller, Jr.
S. Patent No. 3,739,912, 4 p, 3 fig, 2 ref; Official
zette of the United States Patent Office, Vol
1, No 3, p 903, June 19, 1973.

escriptors: *Patents, *Aerobic treatment,
reens, *Flotation, *Sewage treatment, *Waste
ter treatment, Pollution abatement, *Dissolved
ygen, Treatment, Equipment, *Aeration, Storm
ter, Water pollution control, Water quality con-
l.

e or more high-rate rotating screen concentra-
s are described wherein the influent is fed to the
erior of a generally cylindrical, rapidly rotating
een. The concentrator is constructed to permit
persion and atomization of effluent for increas-
exposed fluid surface area and for improved
ntact with air to increase the dissolved and/or
trained oxygen. The dissolved oxygen aids aero-
digestion and the entrained oxygen aids in
thing for flotation and separation of fine solids
d oil. Material which does not go through the
een may be piped to a treatment facility. (Sinha-
IS)
73-13321

RATORS,
non-Hartley Ltd., Stoke-on-Trent (England).
signee)
S. Robertson.
S. Patent No. 3,741,682, 3 p, 3 fig, 10 ref; Offi-
l Gazette of the United States Patent Office,
l 911, No 4, p 1374, June 26, 1973.

scriptors: *Patents, *Activated sludge, *Aera-
n, *Waste water treatment, Equipment, Pollu-
n abatement, Oxygenation, Water pollution
trol, Water quality control.

e aerator comprises a support adapted to be
ated about its central vertical axis. Angularly
ced blades are secured to be underside of the
pport. Each blade has a plate secured to its
er edge and extending on both sides of the
de along at least a part of the length of the blade
m its outer end towards the center of the aera-
This aerator is adapted to be rotated in the sur-
e of a liquid to be agitated and aerated. The
id is thrown out by centrifugal action through
U-shaped duct defined on the leading side of
h blade with respect to the direction of rota-
n. Air is drawn down the U-shaped duct on the
ling side of each blade with respect to the
ction of rotation. The air is drawn down into
region of maximum turbulence and ensures a
d supply of oxygen to the liquid being aerated.
nha-OEIS)
3-13324

PERFORATED TUBE MODULE FOR LIQUID TREATMENT,
Neptune Microfloc, Inc., Corvallis, Oreg. (assignee)
A. K. Hsiung.
U.S. Patent No. 3, 741,401, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, 1303, June 26, 1973.

Descriptors: *Patents, Separation techniques, *Waste water treatment, Equipment, *Liquid wastes, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Kinetic energy.

The apparatus comprises a set of inclined channels selected from perforated partitions or walls. The kinetic energy of an influent liquid is rapidly dissipated as the liquid flows through the perforations while the solids suspended in it settle out on the inclined bottoms of the channels. The liquid flowing through the device flows upward through the settling compartments as well as sequentially from the first to the last, while particles settle out and slide downward to the bottom into a sludge collecting and withdrawing device. (Sinha-OEIS)
W73-13325

WATER PURIFYING APPARATUS,
J. Muller.
U.S. Patent No. 3,741,396, 2 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1301, June 26, 1973.

Descriptors: *Patents, Filters, *Filtration, *Water purification, *Water quality control, *Waste water treatment.

The body of the apparatus has a main inlet port and a main discharge port, with corresponding secondary ports and control valves. A filter tank is mounted on the body. It contains a pair of hollow cylindrical filter elements, each having a wall defining a filter through which fluid may pass. The valves may be manually controlled to direct the untreated water either through the filter elements into the discharge ports or directly to the discharge port. (Sinha-OEIS)
W73-13326

LIQUID FILTERING APPARATUS,
L. F. Defenbaugh.
U.S. Patent No. 3,741,394, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1301, June 26, 1973.

Descriptors: *Patents, *Water purification, Filters, *Filtration, Activated carbon, Water quality control, Equipment, *Waste water treatment.

Apparatus comprises a housing which includes means for inserting the apparatus in the water line. It has removable cartridges containing suitable filtering materials such as activated carbon particles. A three-way diverter valve is operable to divert water flow through the filtering material or straight through the apparatus bypassing the filtering material. A metering valve is used to control the back pressure within the unit in order to maximize contact between the fluid and the filtering material. (Sinha-OEIS)
W73-13327

APPARATUS FOR THE PURIFICATION OF WASTE WATER,
Corodex (N.V.), Zandvoort (Netherlands). (assignee)
M. Adegeest.
U.S. Patent, No. 3,741,392, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1300, June 26, 1973.

Descriptors: *Patents, *Chemical reactions, *Waste water treatment, Phenols, Resins, Pollution abatement, *Water purification, Water pollution control, Water quality control.
Identifiers: Formaldehyde.

The apparatus includes a mixing tank with lines to feed it with contaminated water, acid and phenol. The tank discharges to a heatable reservoir which has a gravity drain to a settling tank as well as an off-take for gaseous products and a bleed-off line from an intermediate zone for conveying fluids to an overflow tank. The overflow tank has a return line to the reservoir and a gravity drain for liquid resin. It is connected to an expansion boiler which is heated by fluid from heat exchange units. A stack removes vapor upward. A bleed-off line to an acid recovery vessel may be added. Air injectors are used as needed to maintain circulation. One or more phenols and an acidic reagent is added to the water to be purified. The phenol-formaldehyde molar ratio is important. The molar ratio in the waste water is generally 1:4.18 that is the percentage of formaldehyde is too high. By adding phenol the molar ratio is brought to 1:1.02 to 1:1.12. The formaldehyde will be bound by the phenol, as a result of which a thin, liquid resin mixture will be separated, while large resin molecules (i.e. -viscous resin) are avoided. (Sinha-OEIS)
W73-13328

TERTIARY FILTER,
Harsco Corp., Wormleysburg, Pa. (assignee)
G. L. Wallace, T. A. Ward, and P. R. Johnson.
U.S. Patent No. 3,741,390, 7 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1300, June 26, 1973. *Patents, *Tertiary treatment, *Waste water treatment, *Liquid wastes, *Filtration, *Pollution abatement, Water pollution control, Water quality control.

This teritary filter unit is intended for use in conjunction with a larger system of waste collection and treatment. This system has automatic control equipment associated with dual filter units allowing filtration through the first unit while filtered solid material is being removed from the second unit. It is adapted to sense a condition wherein one of the filters has become clogged and to automatically switch flow to the other unit while initiating a controlled backwash cycle. In the backwash cycle pressurized air is forced through the clogged filter media. This assures proper bed expansion and uniform agitation, prior to circulating wash water to flush solids out of the media. The contaminated backwash water may then be delivered to a previous stage of the sewage treatment system for further treatment prior to being returned to the teritary filter. (Sinha-OEIS)
W73-13329

METHOD FOR EFFICIENTLY SEPARATING SLURRY-STATE LIQUID INTO SOLID PART AND LIQUID PART AND AN APPARATUS THEREFOR,
Kanegafuchi Boseki Kabushiki Kaisha, Tokyo (Japan). (assignee)
K. Takahashi.
U.S. Patent No. 3,741,388, 10 p, 5 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1299, June 26, 1973.

Descriptors: *Patents, *Waste water treatment, Slurries, *Filtration, *Liquid wastes, Pollution abatement, Water quality control, Water pollution control, *Waste treatment.

Slurry-state liquid waste is poured onto the surface of a liquid-permeable filter. The filter, made of foam, has good elastic recoverability from a compressed state. The liquid is absorbed in the foam whereas the mud-like solid part is retained on the surface of the filter. The filter is mounted on the circumference of a rotary drum. An endless belt serves to transfer the solids from the filter surface to the work surface of the belt. The solids carried on the endless belt are scraped off by a special scraper and allowed to drop into a collecting receptacle. A rotatable roll is placed in pressure

contact with the surface of the foam filter and squeezes out the entrapped liquid which is fed into a lead away vessel. (Sinha-OEIS)
W73-13330

PROCESS FOR TREATING SEPTIC BIOLOGICAL WASTES IN ARCTIC CLIMATES,
Texaco, Inc., New York. (assignee)
E. L. Cole, and H. V. Hess.
U.S. Patent No. 3,740,332, 3 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 911, No 3, p 1004, June 19, 1973.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, *Oxidation, Biological oxygen demand, Chemical oxygen demand, Arctic, Pollution abatement, Water pollution control, Water quality control.
Identifiers: Septic biological wastes, Arctic environments.

A process provides a means of producing a clear effluent of low COD (BOD) which is sterile enough to be discharged into the Arctic environment and a part which may be burned or stored for removal from the Arctic. Wastes are passed into a primary settling zone. The temperature in the settling zone is held between 40 and 180F. The solids are moved to a coking zone and held at a temperature of 400 to 700F under a pressure of about 300 to 3500 p.s.i.g. for a period from 0.5 minutes to 2 hours. The coke is separated from the clear liquid. The cleared liquid (decoked) is mixed with effluent from the primary settler and the resulting mixture is air oxidized. Four examples are cited. (Sinha-OEIS)
W73-13332

PROCESS FOR THE REDUCTION OF THE BIOCHEMICAL OXYGEN DEMAND OF SEWAGE, AND FOR THE RECOVERY OF THE INHERENT PROTEIN,
Tatabanyai Szenbanyak (Hungary). (assignee)
J. Holo, J. Toch, and I. Zagyvai.
U.S. Patent No. 3,738,933, 2 p, 8 ref; Official Gazette of the United States Patent Office, Vol 911, No 2, p 627, June 12, 1973.

Descriptors: *Waste water treatment, *Patents, *Biochemical oxygen demand, *Sewage treatment, *Industrial wastes, *Dairy industry, *Fermentation, *Food processing industry, Slaughter, *Conservation, Pollution abatement, Water pollution control, Water quality control.
Identifiers: *Chemical treatment, Slaughter house wastes, Meat processing industry, Preserve factories.

A process is described for the purification of sewage, and, if required, for the recovery of the inherent protein from sewages. The biochemical oxygen demand of sewage of the type of meat, dairy and fermentation waste, is reduced by adding to the sewage at least 120 g/cu m of a water soluble aluminum salt or bivalent or trivalent iron salt, 0.5 to 1 kfi/cu m of bentonite or kaolin and 5 to 10 g/cu m of polymers or copolymers of acrylic acid-acrylic amide in the form of aqueous solution. The suspension is stirred and the pH adjusted to exceed 10 by addition of a basic calcium compound such as lime milk or calcium hydroxide. The precipitate thus obtained is separated by setting and transferred to a conical tank for treatment with carbon dioxide until the pH is no higher than 7, and the resulting precipitate is filtered and sterilized at a temperature above 130 degrees C, under pressure, to produce a biochemical culture medium or animal feed. (Sinha-OEIS)
W73-13334

METHOD FOR TREATING ACID WATER CONTAINING METALLIC VALUES,
Bethlehem Steel Corp., Pa. (assignee)
P.D. Kostenbader.
U.S. Pa8ent No. 3,738,932, 6 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 911, No 2, p 627, June 12, 1973.

Descriptors: *Patents, *Aeration, *Sludge, *Metals, Alkalis (Bases), *Neutralization, *Acid mine water, Acidic water, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control.

The method consists of treatment with an alkali-water slurry and recycled sludge mix, with or without the presence of air, to neutralize the acidity of the water and to precipitate a substantial portion of the metals. The slurry consists of at least one alkali taken from the gnt iron salt, 0.5 to 1 kfi./cu m ofroup consisting of high calcium lime, magnesia, dolomitic lime and sodium hydroxide. This slurry is mixed with a portion of the densified sludge and the product is mixed with the acid water in a second reactor to cause the mix and acid to react in the presence of air. The precipitate is then allowed to settle out to form a densified sludge and a clarified neutralized water. (Sinha-OEIS)
W73-13335

ANNUAL SCIENTIFIC REPORT 1971 (RADIOACTIVE AND NON-RADIOACTIVE CONTAMINATION OF THE ENVIRONMENT AND THE METABOLISM OF SOME RADIOELEMENTS; RADIOPHYSICAL CONTROL; RESEARCH ON BODY CONTAMINATION; WASTE DISPOSAL RESEARCH; N ON--RADIOACTIVE ENVIRONMENTAL POLLUTION).
Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).
For primary bibliographic entry see Field 05B.
W73-13349

POTENTIAL FOR THE USE OF COBALT-60 IRRADIATION IN THE TREATMENT OF WASTE WATERS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. A. Okun.
Available from NTIS, Springfield, Va., as TID-26341; $4.00 in paper copy, $1.45 in microfiche. Report No TID-26341, June 1973. 33 p, 47 ref.

Descriptors: *Cobalt radioisotopes, *Waste water treatment, *Sludge treatment, Water pollution, Water quality, Chemical degradation, Wastes, Organic wastes, Sludge, Disinfection, Water treatment, Settling basins, Economics, *Reviews, Waste disposal.
Identifiers: *Savannah River Plant, *Cobalt irradiation.

An evaluation of the potential for the use of cobalt-60 irradiation in the treatment of wastewaters is based primarily on a review of the literature in the field. Possible potential for cobalt-60 is in the degradation of organic pollutants and refractory chemicals in wastewaters, improvement in the settling characteristics of solids in wastewaters, improvement in the handling of wastewater sludges, and in the disinfection of wastewaters and sludges. Cobalt-60 irradiation is not very effective in the degradation of pollutants, except for certain specific industrial wastes, and has only a limited impact on the settling characteristics of wastewater solids. It is effective in disinfection of wastewaters. However, even where radiation is effective, the costs for treating wastewaters by irradiation are likely to be far too high to be competitive with other processes that are already available. Cobalt-60 irradiation may be economically feasible for sludge treatment because sludge is more concentrated than wastewater. However, the benefits in sludge handling are not likely to be attractive because alternative methods are more acceptable and economical. The greatest potential is for sludge disinfection, but sludge disinfection is not, nor is it expected to be, widely adopted. (Houser-ORNL)
W73-13401

ENERGY IMPLICATIONS OF SEVERAL ENVIRONMENTAL QUALITY STRATEGIES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05G.
W73-13421

THE APPLICATION OF MODERN SOLVENT EXTRACTION TECHNIQUES TO THE REMOVAL OF TRACE QUANTITIES OF TOXIC SUBSTANCES FROM INDUSTRIAL EFFLUENTS,
Oak Ridge National Lab., Tenn.
W. S. Groenier.
Available from NTIS, Springfield, Va., as ORNL-TM-4209; $4.00 in paper copy, $1.45 in microfiche. Report ORNL-TM-4209, July 1973. 17 p, 6 fig, 13 ref.

Descriptors: *Waste water treatment, *Solvent extractions, *Laboratory tests, *Mercury, *Separation techniques, Pollution abatement, Brine, Toxins, Chemicals, Metals, Feasibility studies, Effluents, *Industrial wastes, Organic compounds, Environmental engineering, Costs, Systems analysis, Design, Immiscibility, Solubility, Solvents.

Tests are proposed to test flowsheet feasibility, develop operating criteria, and eventually test procedures on actual effluents. Entrainment is minimized by internal recycle in each stage. Hg removal from chloralkali plant effluents (see W73-11107) would be the object of initial studies. The loaded organic phase (0.1 M tricaprylamine in an inert dilutent such as xylene) is stripped by a 2.5% ethylenediamine or propylenediamine solution. The extracted brine is recycled to eliminate a large fraction of the total effluent volume. For testing this process a laboratory-scale 4-stage mixer-settler was designed. The estimated fabrication cost is $1000 per stage, including pump purchase and overhead. The residence time required for intimate mixing and subsequent coalescence is about 15 seconds per stage. Choice of an industrial-scale solvent extraction contactor is considered briefly. (Bopp-ORNL)
W73-13422

HEAT RECOVERY IN PROCESS PLANTS,
Struthers Wells Corp., Warren, Pa.
J. P. Fanaritis, and H. J. Streich.
Chemical Engineering, Vol 80, No 12, p 80-88, May 28, 1973. 6 fig, 4 tab.

Descriptors: *Thermal pollution, *Heat exchangers, *Design, *Economic efficiency, Heat transfer, Steam, Steam turbines, Heat treatment, Cooling, Fuels, Costs, Economics, Evaluation, Planning, Power system operations, Industrial plants, Boiler feed water, Pre-treatment (Water).
Identifiers: *Heat recovery systems.

Heat recovery systems can be used to generate steam, to pre-heat boiler feed water, to pre-heat combustion air, for steam superheating, to pre-heat process streams and for circulating heating systems. The primary equipment for heat recovery is broadly classified as either fire-tube or water-tube type depending on whether the elevated-temperature stream is flowing on the inside or the outside of the tubes. The broad range of heat recovery system applications makes it difficult to provide specific guidelines for economic evaluations. The following general guidelines are widely applicable: economic value of the recovered heat should exceed the value of the energy required to produce its equivalent; an economic evaluation of a heat recovery system must be based on a projection of fuel cost over the life of the equipment; environmental restriction must be considered; many elevated-temperature streams require cooling over

a long temperature range; and fuel availability might affect the ability of a plant to maintain operations. (Jerome-Vanderbilt)
W73-13431

ESTIMATING COOLING TOWER COSTS FROM OPERATING DATA,
A. Zanker.
Chemical Engineering, Vol 79, No 13, p 118-119, June 12, 1972. 1 fig, 1 tab, 2 ref.

Descriptors: *Cooling towers, *Cost analysis, *Design criteria, Water cooling, Temperature, Heated water, Heat transfer, Atmosphere, Data collection, Operation and maintenance, Evaluation, Mathematical studies.

Cooling tower costs are estimated using four primary variables; the total heat load, the temperature of the water leaving the tower, the wet bulb temperature of the local atmosphere, and the temperature of the heated water entering the tower. Quick calculations have been developed which relate these factors to the published data on equipment and installation costs. The equation is presented and an example is given. A table presents a comparison of estimated and real cooling tower costs listing various characteristics. (Jerome - Vanderbilt)
W73-13432

TREATMENT OF RADIOACTIVE STEAM-GENERATOR BLOWDOWN,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
W. R. Greenaway, W. J. Klein, J. Markind, and R. R. Stana.
Industrial Water Engineering, p. 22-24, March/April 1973, 2 fig, 3 tab.

Descriptors: *Nuclear powerplants, *Radioactive wastes, *Waste water treatment, *On-site tests, Electric power production, Water pollution, Radioisotopes, Iodine radioisotopes, Phosphates, Boron, Ion exchange, Separation techniques, Laboratory tests, Boilers, Distillation, Reverse osmosis, Evaluation, Costs, Operation.
Identifiers: *Blowdown.

To minimize waste water handling problems, methods of handling contaminated steam generator blowdown were investigated. An ion exchange system design was attempted for radionuclides using a phosphate solution containing boric acid. The potentially contaminated wastes generated by the ion exchange would be 12 gpm when operating to purify a blowdown rate of 45 gpm, exceeding the capacity of the radwaste system by three-fold. Flash distillation, shell and tube distillation and reverse osmosis were considered as alternate approaches. The two distillation processes were rejected on the basis of equipment size and cost. A one-module reverse osmosis system was set up to test the effectiveness in removing phosphate, boron, and radioactive elements. A recovery of at least 90% was possible. At feed pH of 9.2-9.4, a membrane life of 2 years could be expected. Boron removal was about 65%. Six hundred operating hours with no change in performance have been logged in on-site testing, reducing radioactivity by a factor of 100 or more. No problems with iodines and cesium were anticipated as long as the water was recycled. No appreciable savings could be made by using the unit under no-leakage conditions. (Jerome-Vanderbilt)
W73-13447

RY COOLING TOWER USES STEEL STRUCURE,
Hoterv, Budapest (Hungary).
I. Bodas.
Electrical World, Vol 177, No 7, p. 30-34, April 1, 1972. 4 fig.

Descriptors: *Cooling, *Cooling towers, *Heat transfer, *Structural design, Heated water, Structural stability, Structural engineering, Thermal powerplants, Thermal pollution, Structural shapes.
Identifiers: *Air cooling, *Dry cooling towers, Soviet Union, Hungary.

Natural-draft dry cooling towers are now being operated successfully in the Soviet Union rated for 200 Mw at nearly 6,000 ft. of elevation. An aluminum-covered steel structure, required because of high seismic loading, is believed to offer significant economic advantages even for more normal applications, and is believed to open the way to single-tower designs for plants rated up to 1,200 Mw. The plant uses the Heller cooling system adopted after the British, German and Hungarian experience. Design and operating details of the water flow, controlling the heat dissipation, protecting the cooling elements, stiffening the cylindrical section, and construction of the tower skirt, the air coolers and the condensers are discussed in depth. (Oleszkiewicz-Vanderbilt)
W73-13451

TREATMENT OF COMPLEX CYANIDE FOR REUSE OR DISPOSAL,
Berkey Film Processing of N.E., Fitchburg, Mass.
T. N. Hendrickson, and L. G. Daignault.
Copy available from GPO Sup Doc as EP1.23/2:73-269, $2.10; microfiche from NTIS as PB-222 794, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-269, June 1973. 151 p, 41 fig, 15 tab, 81 ref. EPA Project 12120 ERF.

Descriptors: *Waste water treatment, Industrial wastes, Analytical techniques, *Chemical precipitation, *Chlorination, *Oxidation, *Ozone, *Electrolysis, Chlorine, Coagulation, Chemical wastes, Laboratory tests, Electrochemistry, Flocculation, Heavy metals, Toxicity, Costs, Biochemical oxygen demand, Chemical oxygen demand, Water reuse, Recycling, Waste disposal.
Identifiers: *Photofinishing wastes, *Ferricyanide, Chemical recovery, *Cyanides.

Complex cyanides (ferro-and ferricyanide) in industrial waste water effluents impose a direct threat upon the environment. Methods to recover or destroy these compounds were evaluated in laboratory studies. The techniques tested include electrolysis, ozonation, chlorination and heavy metal ion precipitation. The study was conducted to determine the feasibility of using one or more of these methods to reduce the concentration of ferricyanide in both concentrated (10,000 to 100,000 mg/l) and dilute (10 to 100 mg/1) waste effluents. Numerous analytical procedures were developed to enhance the accuracy of sample analysis over the concentration range studied. Ferrocyanide can be oxidized to ferricyanide in overflow photographic color process bleaches using either electrolysis or ozone and the waste bleach recirculated for reuse in the process. Dilute concentrations of ferricyanide can be destroyed using ozone or chlorine under proper conditions of temperature, pH and catalyst addition. (EPA)
W73-13468

REQUISITES FOR NON-POLLUTING MICROBICIDES,
R. A. Schultz, and B. A. Metz.
Industrial Water Engineering, p 18-21, March/April 1973. 1 fig.

Descriptors: *Waste water treatment, *Boiler feed water, *Cooling water, *Microorganisms, *Fouling, Water quality, Water quality control, Industrial water, Pre-treatment, Biochemistry, Water pollution, Corrosion, Microbiology, Aquatic bacteria, Slime, Biocontrol, Toxins.
Identifiers: Aliphatic diamine, Trialkyl benzylammonium chloride.

Biological growth in industrial water systems results in inefficient operation and eventual malfunctioning. Organisms can enter the system and thrive in environs which would appear to be intolerable. Slime formation is the major problem because its glue-like nature allows it to adhere to virtually any surface and to cause fouling. Chlorine, polychlorophenate biocides and organic sulfur compounds have been used as controls in the past, but were either too corrosive, ecologically harmful, or ineffective at various pH levels. The present requirements for microbicides are biodegradability; a wide range of effectiveness; oxidation resistance; compatability at use levels with corrosion inhibitors; effectiveness at higher system water pH levels and penetrating and dispersing abilities against slime formations. The organic amine-type biocides currently available exhibit abilities in all these categories. Aliphatic diamine and trialkyl benzylammonium chloride are two significant amine types. Two case histories are presented to demonstrate the effectiveness of microbiological growth control programs designed in accordance with the parameters outlined. (Jerome - Vanderbilt)
W73-13476

EFFECT ON WHEAT YIELD AND NITROGEN UPTAKE FROM MANURES MADE FROM SPENT-SLURRY,
For primary bibliographic entry see Field 03F.
W73-13601

SOLUTE SEPARATION BY CONTINUOUS BUBBLE FRACTIONATION,
Rutgers - The State Univ., New Brunswick, N.J.
B. T. Kown, and L. K. Wang.
Separation Science, Vol 6, No 4, p 537-552, August 1971. 10 fig.

Descriptors: Waste treatment, *Waste water treatment, Surfactants, *Solutes, Bubbles, Adsorption, *Separation techniques.
Identifiers: Pollutant separation, *Bubble fractionation.

A continuous bubble fractionation system consisting of a vertical Plexiglas tube provided with a source of air bubbles, means of continuous liquid feed, overflow, and bottom effluent has been operated to study the performance of the system. The study primarily involves an examination of the effects of variables such as gas rate, liquid rate, solute concentration, and column size on the effectiveness of the system for separating an organic solute from a dilute aqueous solution. The experimental results indicate that the effects of gas and liquid rate on the performance have generally followed the results expected from an equilibrium adsorption of a surfactant on the gas-liquid interface described by Gibbs' equation and material balances. An increase in gas rate increased the effectiveness of the system by providing more adsorption surface. The adverse transfer of the solute by the eddy diffusion caused by rising bubbles was found to be the factor limiting the effectiveness of the system.
W73-13638

CONTINUOUS BUBBLE FRACTIONATION: PART I, THEORETICAL CONSIDERATION,
Calspan Corp., Buffalo, N.Y.
L. K. Wang, M. L. Granstrom, and B. T. Kown.
Environmental Letters, Vol 3, No 4, p 251-265, 1972.

Descriptors: *Waste water treatment, Water quality control, Evaluation, Bubbles, Solutes, Surfactants, *Adsorption, *Separation techniques.
Identifiers: Pollutant separation, *Bubble fractionation.

The bubble fractionation process is one of a number of adsorptive bubble separation methods which involves the use of selective adsorption of

surface-active solutes at the gas-liquid interfaces of the rising bubbles in a bubble column. It can be used as an advanced treatment method for certain industrial effluents or domestic sewage which contain surface-active substances. In this study, a theory for continuous operation of the bubble fractionation process was developed. The theory involves: (a) the adsorption of surface-active solutes at rising bubble surfaces; and (b) balancing flow in the bubble column against axial diffusion and the departure of solutes from the fractionation system. Theoretical analyses imply that the effectiveness of the continuous bubble fractionation system increases with increasing gas rate and the surface activity of the solute but decreases with increasing column cross-sectional area, axial diffusion and bubble size.
W73-13639

CONTINUOUS BUBBLE FRACTIONATION: PART II, EFFECTS OF BUBBLE SIZE AND GAS RATE,
Calspan Corp., Buffalo, N.Y.
L. K. Wang, M. L. Granstrom, E. L. Bourodimos, and B. T. Kown.
Environmental Letters, Vol 4, No 3, p 233-252, 1973.

Descriptors: *Waste water treatment, Water quality control, Evaluation, Bubbles, Solutes, Surfactants, Adsorption, *Separation techniques.
Identifiers: Pollutant separation, *Gas rate, *Bubble size, *Bubble fractionation.

Theoretical equations developed for continuous bubble fractionation process have been evaluated experimentally using bubble size and gas flow rate as variables. Variations of bubble size and gas flow rate, which will affect the column performance of either batch or continuous bubble fractionation system, are predicted by the developed theory. Based on theoretical development and experimental verifications, several approaches for the improvement of the bubble fractionation system are suggested.
W73-13640

CONTINUOUS BUBBLE FRACTIONATION: PART III, EXPERIMENTAL EVALUATION OF FLOW PARAMETERS,
Calspan Corp., Buffalo, N.Y.
K. Wang, M. L. Granstrom, E. L. Bourodimos, and B. T. Kown.
Environmental Letters, Vol 5, No 2, p 71-89, 1973.

Descriptors: *Waste water treatment, Water quality control, Evaluation, Bubbles, Solutes, Surfactants, Adsorption, *Separation techniques.
Identifiers: *Liquid flow rates, Gas rate, Pollutant separation, *Bubble fractionation.

The performance of a bubble fractionation process was investigated experimentally using liquid flow rate and gas flow rate as variables. Based on an ideal model, the theoretical performance of the continuous bubble fractionation process was qualitatively evaluated.Experimental results indicate that an increase in the bottom effluent rate while keeping the overflow rate constant increases the solute concentration in the top overflow. An increase in overflow rate while keeping the bottom effluent rate constant decreases the solute concentrations of top overflow, but decreases insignificantly the bottom effluent's solute concentration. When the feed rate is constant, optimization of the bubble fractionation system can be achieved by regulating the top-to-bottom flow rate ratio. For practical engineering application, a meaningful combination of physical dimensional parameters into dimensionless operational charts can be useful for plant operators in operating the continuous bubble fractionation process.
W73-13641

EVALUATION AND DEVELOPMENT OF PHYSICAL-CHEMICAL TECHNIQUES FOR THE SEPARATION OF EMULSIFIED OIL FROM WATER,
Calspan Corp., Buffalo, N.Y.
K. Wang, Y. Yang, and B. Dahm.
Technical Report, Calspan Report No. 189, 31 p, 7 tab, 40 ref, May 1973.

Descriptors: *Waste water treatment, Evaluation, Flotation, Magnetization, Coalescence, Chromatography, *Filtration, Reverse Osmosis, *Absorption, Coagulation, *Polyelectrolytes, Sedimentation, Oil, Physicochemical properties, *Separation techniques, Emulsions, Oil-water interfaces, Reveiws.
Identifiers: Oil Pollution Control, *Carbon adsorption.

Various methods for separating emulsified oil from water were surveyed and investigated. A state-of-the-art review of physical-chemical processes for oil-water separation included conventional coalescence, chromatography, layer filtration, reverse osmosis, absorption filtration, hydrocyclone, centrifugation, settling, chemical coagulation, evaporation/distillation, freezing, biological oxidation, clarification, flotation, and solvent extraction. A search for some universally applicable methods for the separation of emulsified oil from water was made. Promising physiocochemical processes for oil-water separation include: (1) granular carbon adsorption; (2) powdered carbon adsorption followed by polyelectrolyte coagulation and final polishing; and (3) powdered carbon adsorption followed by direct filtration. Greater than 99% oil removal can be achieved with these processes.
W73-13642

EFFECT OF CALCIUM LIGNOSULFONATE ON PROPERTIES OF CONCRETE AT EARLY AGES,
Missouri Univ., Rolla.
L. K. Wang.
M. S. Thesis, 1965. 63 p, 7 tab, 23 fig, 11 ref.

Descriptors: Lignins, Sulfonates, Sulfite liquors, Pulp wastes, Concretes, Cements, *Recycling, *Water reuse, Concrete mixes, Compressive strength, Tensile strength, *Concrete additives.
Identifiers: Calcium lignosulfonate, Concrete beam, Concrete cylinder, *Lignosulfonates.

Lignosulfonate (or lignin sulphonate) is a plant constitutent which is often discharged as waste during the manufacture of paper by the sulfite pulp process. This giant polymer waste constituent is difficult to remove by biological treatment techniques. A new tendency of paper and pulping waste treatment is the recovery of lignin from the wastewater for reuse. In this program, the feasibility of using the recovered lignosulfonate as a concrete admixture was investigated. Lignosulfonate was tested for its effect on the tensile and compressive strength of plain concrete cylinders, and for its effect on the flexural strength of plain concrete beams. The effect of the admixture on shrinkage, slump, air content and unit weight was also studied. The test results showed that lignosulfonate reduces the amount of water required to make a workable concrete mix; a more workable mix saves money because it is easier to place, thus reducing labor requirements for the project. Reducing the water content while leaving the cement factor unchanged results in concrete of higher tensile, compressive and flexural strengths at all ages.
W73-13644

EFFECT OF PH ADJUSTMENT UPON ACTIVATED CARBON ADSORPTION OF DISSOLVED ORGANICS FROM INDUSTRIAL EFFLUENTS,
Calspan Corp., Buffalo, N.Y.
L. K. Wang, R. P. Leonard, D. W. Goupil, and M. H. Wang.
Preprint presented at the 27th Annual Purdue Industrial Waste Conference, Purdue University Lafayette, Indiana, May 1972: 22 p, 5 tab, 17 ref.

Descriptors: *Hydrogen ion concentration, *Activated carbon, *Waste water treatment, Polymers, Hydrolysis, *Adsorption, Pulp Wastes, Lignins, *Industrial wastes, Solutes.
Identifiers: Adsorption capacity, Adsorption rate, *Dissolved organics, Glue factory wastes.

The influence of the initial hydrogen ion concentration on carbon adsorption of organic solutes was reviewed and studied experimentally. The adsorption mechanisms describe carbon adsorption of single organic compounds from aqueous solutions. Since industrial effluents generally include multicomponent organic solutes, the optimum pH for activated carbon treatment of specific industrial effluent must be determined experimentally because many competing adsorption mechanisms are involved.
W73-13646

TREATMENT OF GLUE FACTORY WASTE BY PHYSIOCOCHEMICAL PROCESSES,
Calspan Corp., Buffalo, N.Y.
Lawrence K. Wang, Richard P. Leonard, and Dennis W. Goupil.
Project Report VT-3045-M-3, 79 p, 9 fig, 12 tab, 7 ref., January 1972.

Descriptors: *Waste water treatment, Recycling, Water reclamation, *Activated carbon, Adsorption, *Coagulation, *Filtration, *Chlorination, Cost analysis, Physicochemical properties.
Identifiers: Tannin, *Glue factory wastes, Carbon adsorption.

In an animal glue plant, the two waste streams of greatest concern are the alkaline waste containing lime, protein, blood, and dirt from the lime curing and washing operations, and the acid waste containing sulfuric acid, chromium sulfate, dissolved organics, and hydrochloric acid from the acid treatment, washing, and neutralization operations. There has been little success in developing adequate and economical methods for the abatement of glue factory pollutant discharges. The treatment procedures investigated were equalization, sedimentation, carbon adsorption, coagulation, sand filtration and chlorination. Two conceptual physicochemical waste-treatment systems are proposed in what is believed to be an optimum combination of appropriate unit processes. Experimental results indicate that high reductions of chemical oxygen demand, dissolved protein, tannin, suspended solids, chromium, turbidity, and color could be achieved by the proposed waste treatment systems. The purified effluent could be recycled for in-plant use in glue factory operations.
W73-13647

SURFACE ADSORPTION: A PROMISING APPROACH FOR THE TREATMENT OF TANNERY EFFLUENTS,
Calspan Corp., Buffalo, N.Y.
L. K. Wang.
Project report VT-3045-M-Z, 60 p, 11 fig, 11 tab, 43 ref, Oct. 1971.

Descriptors: *Waste water treatment, *Adsorption, Physicochemical properties, Carbon, *Flotation, Foam separation, Surfactants, *Tannery wastes, Industrial wastes, *Water reuse.
Identifiers: *Surface adsorption, *Combined treatment.

Three candidate physicochemical processing techniques for removing pollutants from tannery effluent are described which allow a greater bulk of the wastewater to be reclaimed as a useful

ater resource. Organic substances, and Cr, under rtain circumstances, can also be recovered as eful by-products. The techniques are specific rface adsorption processes: foam separation thout additives, adsorbing colloid flotation, and sorption flotation. Foam separation without ad- ives is not feasible for the removal of either dis- lved organics or suspended solids from tannery astes. Adsorbing colloid flotation is feasible for e primary treatment of tannery wastes, provided at dimethyldihydrogenated-tallow ammonium loride or the like is used as a collector. Adsorp- n flotation, combining carbon adsorption and tation into a single process, can achieve a high ctional removal of both dissolved and spended pollutants. Utilizing carbon adsorption d flotation in series would have the same effi- ncy as that of adsorption flotation. Other aux- ry physicochemical unit processes, such as limentation, sand filtration, lime precipitation, d centrifugation, are also investigated.
73-13648

E. Ultimate Disposal of Wastes

ASIBILITY OF USING PULP MILL SLUDGE AN ADDITIVE TO CORRUGATING MEDI- I,
shington Univ., Seattle. Coll. of Forest sources.
H Hsv.
y 1972, 31 p. 12 fig, 4 tab, 10 ref, append. VRR-A-043-Wash (2).

scriptors: Pulp and Paper Industry, *Pulp stes, Waste disposal, *Sludge disposal, Indus- l wastes, Effluents, Water reuse, *Recycling.
ntifiers: *Pulp mill sludge.

is research was concerned with a method to pose of the ever accumulating sludge which nes from the clarifiers when the solids are noved from the effluent waters of a pulp mill. e objective was to determine if sludge could be d as an extender in corrugating medium. The in idea was to utilize the sludge rather than ply dispose of it. Sludge from three different e mills was added in quantities of 10, 20 and 40 cent to a commercial corrugating medium nish. Handsheets made by an improved labora- y method were tested for flat crush strength. e addition of sludge to the commercial furnish uced the flat cursh strength. The reduction is ieved accounted for at least in part by the ex- sive chemical fiber content of the experiment nish. Therefore, further tests, varying the fiber t, are needed before the idea of using sludge in rugating medium can be discarded. The chanism of flute failure during the flat crush was investigated. Pressing the medium at 130 after drying gave maximum flat crush strength. eater pressures decreased strength due to uced caliper which more than offset any ther improvement due to increased density of sheet.
3-13081

ELIMINARY REPORT ON THE DISPOSAL OIL-FIELD BRINES IN THE RITZ-CANTON L FIELD, MCPHERSON COUNTY, KANSAS,
reau of Mines, Bartlesville, Okla. Petroleum periment Station.
primary bibliographic entry see Field 05G.
3-13564

F. Water Treatment and Quality Alteration

CONDARY SEWAGE TREATMENT IN FELINE CONTACTORS,
aware Univ., Newark. Dept. of Chemical En- eering.
primary bibliographic entry see Field 05D.

W73-13077

EFFECTS OF A POLYELECTROLYTE AS A FILTER AID,
Detroit Dept. of Water Supply, Mich.
M. A. Garnell.
Journal of the American Water Works Association, Vol 55, No 5, p 597-601, May 1963. 2 ref.

Descriptors: *Water treatment, *Electrolytes, *Filtration, Water quality, Turbidity, Mixing, Flocculation, Head loss, *Polyelectrolytes, *Filters.
Identifiers: Filter aid.

The safety and palatability of water increases with the degree of clarity. The danger of passage of viruses into drinking water is reduced when a high degree of turbidity removal is achieved. In addition, the recently developed chemicals, pesticides, and fertilizers in increasing variety and quantity are finding their way into water sources; some of these materials are obnoxious and even dangerous to public health. Therefore, filters should be maximum efficiency. At one Detroit water treatment plant, which has a mixing chamber with a retention time of about 5 minutes, slugs of industrial wastes sometimes caused poorer filtered water quality for several hours. The same raw water conditions often go unnoticed at two other plants where long periods of flocculation are provided. A polyacrylamide with a molecular weight of approximately 1,000,000, which is slightly anionic (Separan NP 100) was tested as a filter aid. At continuous dosage of 20 ppb the effluent turbidity is reduced from 0.5 to less than 0.1 unit in about 2 hours. If dosing is discontinued, turbidity again increases in about 2 hours. At less than 10 ppb dosage, the minimum turbidity remained about 0.1 unit. Application of the electrolyte directly to the filters increases the rate of head loss in proportion to the dosage rate. At 10 ppb the rate of increase in head loss was 30-40% higher and at 30 ppb approximately 100% higher. (Bean-AWWARF)
W73-13089

OPTIMUM ECONOMICAL DESIGN FOR MUNICIPAL DIATOMITE FILTER PLANTS,
Iowa State Univ., Ames.
E. R. Baumann, and R. L. LaFrenz.
Journal of the American Water Works Association, Vol 55, No 1, p 48-58, January 1963. 6 fig, 5 tab, 5 ref.

Descriptors: *Water treatment, *Filters, *Design, *Diatomaceous earth, *Flow rates, *Economics, *Automation, Head loss.
Identifiers: *Diatomite filters, Filter aids, Coagulant aids.

The design of a diatomite filtration plant should be based on an optimum combination of filtration rate, filter cake terminal-head loss, and rate of body feed which will produce potable water at a minimum cost. The cost is a function of labor, power, diatomite, and equipment. A method of finding the optimum is demonstrated. Conclusions are (1) With manual operation, short filter runs are not economical, (2) Of three filtration rates tested, a rate of 1 gpm sq. ft. was optimum, (3) Optimum body feed was relatively low; with 7-8 ppm iron in the water the optimum was 40 ppm diatomite, (4) Terminal head losses between 50 and 100 ft. of water were optimum at low body feed rates, since long runs were necessary for the labor economy, (5) At high body feed rates power becomes the dominating factor and lower terminal head loss produced the minimum cost, (6) Automation reduced the terminal-head loss for minimum cost, (7) Automatic operation resulted in largest production cost saving for the smallest city, however maintenance could be a problem if qualified personnel were not readily available, (8) Lower iron concentrations were cheaper to filter, (9) Production costs were less for a large city than for a small city, and (10) Production costs could be 400-500% higher than necessary if other than optimum conditions of flow rate, terminal-head loss, and body feed were used. (Bean-AWWARF)
W73-13090

ANALYSIS OF ORGANIC CONSTITUENTS PRESENT IN DRINKING WATER,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Petroleum Technology and Petrochemistry.
For primary bibliographic entry see Field 05A.
W73-13240

ADSORBING AND ADHESIVE MATERIALS FOR VIRUS REMOVAL FROM WATER, (IN RUSSIAN),
L. I. Hloba, L. M. Lastovets', M. M. Rotmistrov, M. F. Holub, and L. S. Radolyts'ka.
Dopov Akad Nauk Ukr RSR Ser B Heol Heofiz Khim Biol. Vol 33, No 11, p 1036-1038. 1971. English summary.
Identifiers: Adhesive materials, Adsorbing materials, Agloporite, Bentonite, *Disinfection, Gel, Gypsum, Permutite, Polygorskite, Pyrophyllite, Silica, Vermiculite, Virus removal, Water treatment, Chemical precipitation.

Minerals including polygorskite, bentonite, agloporite, vermiculite, permutite, pyrophyllite, gypsum and silica gel can remove viruses by precipitation in water to secure more complete disinfection.--Copyright 1973, Biological Abstracts, Inc.
W73-13389

THE PRESENT STATUS OF RESEARCH ON THE DISINFECTION OF DRINKING WATER IN THE USSR,
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
S. N. Cerkinskij, and N. Trahtman.
Bull WHO. Vol 46, No 2, p 277-283. 1972. Illus.
Identifiers: Chlorine, Disinfectants, *Disinfection, Enterobacteriaceae, Enteroviruses, Gamma-rays, Ozone, USSR, Virucides, *Water treatment, *Potable water.

Recent USSR research was aimed at evaluating methods of disinfecting drinking water and at elucidating the mechanisms involved. The use of chlorine, ozone, and gamma-rays was discussed, as were their advantages and disadvantages and their effects on Enterobacteriaceae and on enteroviruses.--Copyright 1973, Biological Abstracts, Inc.
W73-13390

WATER TREATMENT FOR HEATING AND PROCESS STEAM BOILERS,
K. W. Herman, and L. R. Gelosa.
Power Engineering, Vol 75, No 4, p 54-57, April 1973. 3 fig, 1 tab.

Descriptors: *Boiler feed water, *Water treatment, *Corrosion control, Water quality control, Water quality, Boilers, Deaeration, Filtration, Water softening, Demineralization, Scaling, Oxidation, Heating, Heated water.

Boiler feed water treatment programs for the purposes of preventing deposit formation, control of corrosion and prevention of boiler water carryover are discussed. Consideration of the whole system must be made when choosing a treatment program. The treatments considered are filtration, sodium zeolite softening, hot lime softening followed by filters and sodium zeolite softening, cold lime clarification and partial softening followed by filters and sodium zeolite softeners, and demineralization. Sludge conditioners containing polymers, organics, sequesterants, iron sequesterant-dispersant, and antifoam prevent deposits while acting as an on-stream cleaner.

Chelates, if carefully used, will prevent scaling and baked on sludge. Water carryover which reduces steam quality and leads to after boiler deposits, plugged values and traps, and turbine damage, can be prevented by steam separation device maintenance and use of antifoam agents. Corrosion due to oxidation can be reduced by deaeration of the feedwater. Adjustment of pH is another method of preventing corrosion. (Jerome - Vanderbilt)
W73-13462

MAGNETIC TREATMENT OF WATER.
Informatics, Inc., Rockville, Md.

Available from NTIS, Springfield, Va 22151 as AD-757 887 Price $3.00 printed copy; $1.45 microfiche. Report, January 30, 1973. 2 fig, 6 ref. ARPA Contract No F44620-72-C-0053.

Descriptors: *Water treatment, *Scaling, *Boilers, *Reviews, *Magnetic studies, Water softening, Water chemistry.
Identifiers: *Magnetic treatment (Water).

A magnetic field of some 100 to 1000 oersteds is effective in preventing the formation of scales or incrustations in boilers and heating systems. After magnetic treatment, natural water does not, when heated, produce a hard scale on the walls of the boiler or in heating pipes, but rather a loose sludge which settles to the bottom and can easily be removed or flushed without acid treatment. A large number of papers pertinent to magnetization and to such questions as how a magnetic field acts on water, for what purposes magnetic treatment is effective, and under what conditions it is most effective and efficient, have been published in the Soviet Union over the last 20 years. In some cases the conclusions drawn by various authors, based on laboratory experiments, have been completely contradictory. The only fact which is generally agreed upon seems to be that a magnetic field reduces the kinetics of crystallization processes and the freedom of movement of charged particles. (Knapp-USGS)
W73-13544

ELECTROPHORETIC EVALUATION AND PROCESS CONTROL,
Philadelphia Water Dept., Pa.
E. L. Bean, S. J. Campbell, and F. R. Anspach.
Water Works and Wastes Engineering, Vol 2, No 11, p 47-51, Nov. 1965. 5 fig, 1 tab, 5 ref.

Descriptors: *Water treatment, Sanitary engineering, *Water quality, *Zeta potential, Electrophoresis, *Colloids, Oxidation, Hydrogenion concentration, Activated carbon, Kalonite, Color, Turbidity, Taste, Odor.
Identifiers: *Process control.

Studies and plant experience have demonstrated that: odor-producing materials do not associate to any major extent with hydrophobic colloids; High negative zeta potential indicates the colloids are hydrophilic, normally indicating wastes or sewage pollution; ZP is a dominant factor in coagulation control; ZP control of coagulation processes can produce savings; ZP and pH zones, once established, for any type of treatment, may thereafter be utilized for control. Present information indicates that: color removal with alum coagulant requires neutral to slightly positive ZP; Color removal with ferric coagulant is best with slightly positive ZP; Turbidity removal requires negative ZP, the magnitude required varying greatly in the presence of different clays; Removal of hydrophilic colloids will reduce odors in plant effluents. Presently no method of effecting direct removal of dissolved organics has been developed, other than adsorption by activated carbon, possibly calcined kaolin or chemical oxidants. (Bean-AWWARF)
W73-13547

FLOATING AERATOR,
Yeomans Brothers Co., Melrose Park, Ill.
J. A. Roeber, R. J. Nogaj, E. J. Ciabattari, and E. Hurwitz.
Water Works and Wastes Engineering, Vol 2, No 12, p 64-66, Dec. 1965. 4 ref.

Descriptors: *Water treatment, *Water quality, *Aeration, Dissolved oxygen, Efficiencies, *Design.

It has been demonstrated that artificial aeration of an oxygen-deficient stream, using a floating aerator system, is a feasible method for raising the dissolved oxygen content. Tests at three sites showed that dissolved oxygen concentration of the river could be increased with energy efficiencies varying from 0.82 to 2.7 lb of oxygen per hp-hr. Efficiency decreased as the concentration of DO increased. Maximum efficiencies are obtained when the units are placed at points of low DO and high velocity of flow, with the aerators placed across the stream, not one downstream from the other. For equal oxygen transfer, many small aerators will require less power than a few large aerators. However, other costs normally decrease with increasing unit size. The sizing of aerator units should be established after investigating the stream under consideration. The oxygen transfer efficiencies reported were somewhat less than those normally obtained in an activated sludge plant. However, river aeration requires no cost for tankage. A new aerator blade was developed which produced higher efficiencies than those previously manufactured. (Bean-AWWARF)
W73-13548

TREATMENT OF ACID MINE WATERS,
Rohn and Haas Co., Philadelphia, Pa.
F. Pollio, and R. Kunin.
Water and Wastes Engineering, Vol 4, No 8, p 64-66, Aug. 1967. 2 fig, 4 tab.

Descriptors: *Water treatment, Water quality, Water softening, *Mine water, Hardness (Water), Lime, *Anion exchange, *Resins, Aeration, Coagulation, Sedimentation, *Electrolytes.
Identifiers: Amberlite IRA-68.

A basic process has been developed whereby a 3,000 ppm acid mine drainage water may be processed to yield water suitable for industrial, agricultural and domestic purposes. The process is based on use of the conventional gel anion exchange resin, Amberlite IRA -68, which, used in a column operation, functions in the bicarbonate cycle. The effluent water is aerated and clarified to give useful water, whose quality may be further improved through lime softening. In the clarification step, improved clarification and sedimentation rates may be obtained using an anionic polyelectrolyte. Because some precipitation may occur during alkalization, it has been necessary to operate in an unconventional upflow manner during the ion exchange step. No noticeable pressure drop nor deposition of precipitates into the resin exchange capacity has been achieved. The process possesses much flexibility, and a water of practically any desired quality may be obtained, something that direct lime neutralization methods have not achieved. (Bean-AWWARF)
W73-13549

A LITTLE PHENOL STIRS UP A LOT OF PUBLIC RELATIONS,
Wilmington Water Cept., Del.
M. S. Shane.
Water Works Engineering, Vol 115, No 5, p 340-342, May 1962.

Descriptors: *Water treatment, *Public health, *Taste, *Odor, Chlorination, *Activated carbon, Monitoring, Water pollution, *Phenols, *Delaware.
Identifiers: Wilmington (Del).

Wilmington water department has been plagued a times with phenol type pollution in concentration of 10 to 25 ppb in the Brandywine creek, particu larly in December and January. The pollution is o a batch nature. Because of its intermittency it i hard to locate the source, particularly across stat lines. The two state agencies must work together A different source has been responsible each time It is detected at the plant which is approximatel 24 hours away from the points of pollution. Odo tests are run every hour, after chlorination t produce the chloro-phenol if present. Activate carbon is applied continuously but if a lag in in creased dosage occurs when the phenols ar received there is a clamor of telephone calls. Mos of such problems occur late at night or in earl morning when laboratory personnel are not im mediately available. Taste tests are used after fi tering the raw water through a membrane filter an chlorinating it. Sometimes the phenol is detecte by this method when it was not detected by odo In the past five years threshold taste above 1 ha been present 2 1/2 days per year, or less than 1 pe cent of the time. (Bean-AWWARF)
W73-13550

RESULTS OF DRINKING WATER TESTING I THE SZCZECIN PROVINCE AREA UN DERTAKEN AS PROPHYLACTIC MEASUR AGAINST ALIMENTARY POISONING OF IN FANTS, (IN POLISH),
For primary bibliographic entry see Field 05A.
W73-13581

ON BACTERIAL AFTERGROWTH IN DRINK ING AND INDUSTRIAL WATER: I. THE IN FLUENCE OF ION-EXCHANGE PLANTS (I GERMAN),
Hygiene-Institut, Frankfurt am Main (West Ge many). Abteilung Hygiene.
R. H. W. Schubert.
Zentralbl Bakteriol Parasitnekd Infektionskr Hy Erste Abt Orig Reihe B Hyg Praev Med, Vol 15 No 5/6, p 488-501, 1972, Illus, English summary.
Identifiers: Alcaligenes, Bacteria, *Bacterial afte growth, Disinfection, Ions, Pseudomonas sp *Potable water, *Industrial water, *Ion exchange

Comparative examinations carried out on io exchanger plants showed that the mode of their a tion is essential to the degree of bacterial afte growth developing in the water on its passag through the exchanger bed. Intermittent operatio of the exchanger including prolonged hold-u periods of the water in the exchanger bed w promote bacterial growth. When the water is bei used continuously, or when certain amounts of are employed or decanted automatically eve hour, bacterial growth does not occur or is ke within limits. The numbers of bacteria show no a ditional increase in the course of its passag through the ion exchanger. Model experimen showed that the exchanger functions mainly as large surface. Studies on the organisms respon ble for bacterial aftergrowth showed that certa Pseudomonas species present at lesser or high numbers in the tap water preferentially propaga in the exchanger bed since the relative numbers other Pseudomonas species occurring in tap wat show a decline. The gram-positive bacteria mo or less commonly found in tap water usual propagate at a lower rate than the Pseudomon species do. In one of the plants examined, distinct increase was noted in the content of ba teria belonging to the Alcaligenes group. The fo lowing conclusions were drawn: the flow throu the ion-exchanger plant should be kept as contin ous as possible, regular disinfection, e.g., simu taneously with regeneration, will be successf only when the period of contact with the disinfe tant of the exchanger is kept as long as possib With the currently used methods of exchang regeneration, the period of contact is not suf cient.--Copyright 1973, Biological Abstracts, Inc
W73-13629

. Water Quality Control

**TITUTIONAL REQUIREMENTS FOR OP-
IAL WATER QUALITY MANAGEMENT IN
D URBAN AREAS,**
orado State Univ., Fort Collins. Environmental
ources Center.
R. Walker, G. V. Skogerboe, R. C. Ward, and
. Huntzinger.
ilable from the National Technical Informa-
Service as PB-222 495, $3.00 in paper copy,
5 in microfiche. Completion Report Series Par-
Report No 48, June 1973. 39 p, 3 fig. OWRR-B-
COLO (4).

criptors: *Farm wastes, *Institutional con-
ints, Mathematical models, *Optimization,
tem analysis, Urbanization, Waste water treat-
t, *Water management (Applied), *Water
ity, Water supply, *Alternative planning, *Re-
al analysis.
tifiers: *Arid-urbanizing regions.

er management strategies in arid urbanizing
ons require careful evaluation of alternatives
supplying future demands and controlling
r quality. Mathematical models were
loped which describe the interrelationships
ng various institutional factors in order to
neate the requirements for implementing op-
l policies. The first of two study areas selected
est the utility of the models is Denver,
orado. This area is an excellent example of an
where the conditions of water scarcity and in-
singly stringent water quality standards are
cal. The Utah Lake drainage area in central
n is the second region considered. In this re-
, water quality management is necessary to in-
the continued use of water in the downstream
ulation center of the state. Together these
els produce results useful in determining the
mal strategies for water management in arid
nizing areas. A generalized summary is
ented to integrate these findings into a West-
e evaluation of this problem.
-13002

**MPLEXES AFFECTING THE SOLUBILITY
CALCIUM CARBONATE IN WATER,**
ois State Water Survey, Champaign.
primary bibliographic entry see Field 02H.
-13004

**ERMINATION OF OPTIMAL MULTIPLE
S OF A SMALL WATER RESOURCE,**
sachusetts Univ., Amherst. Water Resources
earch Center.
primary bibliographic entry see Field 06A.
-13009

**SIBILITY OF PLASTIC FOAM PLUGS FOR
LING LEAKING CHEMICAL CON-
NERS,**
kwell International Corp., Canoga Park, Calif.
ketdyne Div.
. Mitchell, C. L. Hamermesh, and J. V. Lecce.
y available from GPO Sup Doc as
.23/2:73-251, $0.85; microfiche from NTIS as
222 627, $1.45. Environmental Protection
ncy Technology Series Report EPA-R2-73-
May 1973. 60 p, 22 fig, 3 tab, 4 ref. EPA Pro-
15090 HGW. 68-01-0106.

criptors: Water pollution control, *Sealants,
micals, *Leakage, *Accidents, *Transporta-
Plastics.
tifiers: Hazardous chemical spills, *Chemical
ainer leaks, *Plastic foam plugs.

ogram was conducted to evaluate the feasibili-
f methods for plugging leaks in damaged
nical containers by application of suitable
ic barriers. Such a system would be valuable
elping to prevent water pollution from spilled hazardous chemicals. A large number of candidate sealants were evaluated in laboratory screening tests, including various urethane foams; polystyrene and polyvinyl acetate instant foams; filled and unfilled epoxy systems; and polysulfide, butyl, neoprene, and silicone rubber systems. The most promising results were obtained with the urethane foams. Additional evaluation and scaleup tests were made, including sealing of leaks of many different hazardous chemicals, application to leaks both under water and in air, and sealing of leaks in 55-gallon containers. The feasibility of this concept was demonstrated. As a consequence of the success already realized, it is probable that a practical and useful system, embodying this approach, can be developed. (EPA)
W73-13019

DATA ACQUISITION SYSTEMS IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward.
Copy available from GPO Sup Doc as EP1.23/3:73-014, $2.85; microfiche from NTIS as PB-222 622, $1.45. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-R5-73-014, May 1973. 259 p, 25 fig, 9 tab, 10 ref. EPA Project 16090FUO.

Descriptors: Sampling, Information retrieval, *Network design, Cost comparisons, Monitoring, Operations, Data collections, Water quality control, *Colorado, *Water quality standards, *Regulation.
Identifiers: *Water quality management, *Data acquisition systems.

The role of routine water quality surveillance was investigated, including a delineation of the objectives of a state water quality program based upon the state and federal laws. Seven specific objectives are listed under the two general objectives of prevention and abatement: planning, research, aid programs, technical assistance, regulation, enforcement, and data collection, processing, and dissemination. Each objective was broken down into the general activities required for its accomplishment and the data needed for each activity were identified. A survey of systems for grab sampling, automatic monitoring, and remote sensing was performed, each data acquisition technique being analyzed for capabilities, reliability, and cost. A procedure was developed for designing a state water quality surveillance program responsive to objectives. The design procedure has two major aspects: (1) determination of the agency's control strategy, and (2) characterization of streams according to use and quality conditions. The optimum grab sampling network is then designed and possibilities of substituting automatic monitoring and remote sensing at various points in the network are explored. The design procedure was applied to the State of Colorado and a water quality monitoring system was developed for the Water Pollution Control Division of the Colorado Department of Health. Financial and manpower constraints were considered in the design. (EPA)
W73-13024

ENVIRONMENTAL PROTECTION THROUGH PUBLIC AND PRIVATE DEVELOPMENT CONTROLS,
Pennsylvania Univ., Philadelphia. Inst. for Environmental Studies.
A. L. Strong, and J. C. Keene.
Copy available from GPO Sup Doc as EP1.23/3:73-018, $2.10; microfiche from NTIS as PB-222 587, $1.45. Environmental Protection Agency, Socioeconomic Studies Series Report, EPA-R5-73-018, May 1973. 116 p, 18 tab, 14 ref. EPA Project 16110 EDC.

Descriptors: *Attitudes, *Community development, Easements, Land tenure, Leases, Scenic easements, Zoning, Land use, *Land development, *Protection.
Identifiers: *Land use controls, Development corporations, Conservation easements, *Brandywine project.

The studies described are an integral part of a much larger study of land management for purposes of water resource protection. The larger study is popularly known as the 'Brandywine Project.' The research is classified into three principal categories: (1) research directly related to the Brandywine Project; (2) investigation of public regulatory and less than fee controls on development; and (3) shaping of the concept of a private development corporation. The research approach is predominantly legal and governmental. In all instances in which information is available, citizen response to the various development controls has been examined and is included in the research reports. The research conclusion is that greater use of large-scale public and private control of land development can not only contribute significantly to water resource protection but will also increase private benefits. Increasing use of these forms of controls is predicted despite a substantial amount of opposition from private landowners. (EPA)
W73-13025

A PROTOTYPE HIGH SEAS OIL RECOVERY SYSTEM: PHASE I--SYSTEM DEVELOPMENT, VOL. III,
Lockheed Missiles and Space Co., Sunnyvale, Calif.
W. T. Beran, B. Bruch, and K. R. Maxwell.
Available NTIS, Springfield, Va 22151 as AD-758 353, Price $3.00 printed copy; $1.45 microfiche. Coast Guard Office of Research and Development Final Project Report 724103.06.3, February 1972. 176 p.

Descriptors: *Oil spills, *Water pollution sources, *Pollution abatement, Methodology, Research and development, Water pollution control, Oil pollution, Ecology.
Identifiers: *Oil spill recovery.

Results are presented on the preliminary design and development of a high seas oil spill recovery system. Included are (1) tests of a unique oil recovery device, (2) scaling relationships for oil recovery, and (3) preliminary design of an oil recovery system. The oil recovery device consists of a series of vertical discs held in position by horizontal vanes which are attached on the disc peripheries. A stationary hollow trough is mounted through the center of the disc-vane assembly. Between the discs and attached to the top of the shaft are wipers. The discs, immersed less than their radius, rotate through the oil-water liquid to effect oil recovery. Calm water tests were made for 4-, 6-, and 8-ft devices in various oils and slick thicknesses. Results are also given for a 1/9-scale model of an 8-ft diameter device tested in a tow basin. Analyses include attempts to develop mathematical models of the recovery process, oil recovery predictions based on test data for a 4-ft diameter by 13-ft long device mounted on a catamaran, and analyses of catamaran motion response in various seaways. (Woodard-USGS)
W73-13040

A DECADE OF JUDICIAL DEVELOPMENTS AND CHANGES IN COLORADO WATER LAW: 1960-1970,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 06E.
W73-13070

WATER POLLUTION: ENVIRONMENTAL IMPACTS AND MEANS OF CONTROL,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple Jr.
Eighth Annual Henry M. Shaw Lecture, Series in Civil Engineering, January 1973, Dept. of Civil Engineering, North Carolina State University, Raleigh, N.C., 26 p. OWRR-A-025-NJ (3).

Descriptors: *Environmental effects, Ecology, Environmental engineering, Water pollution, *Federal Water Pollution Control Act, Planning, *Water quality control.
Identifiers: Water quality planning, *Environmental impacts.

The enormous cost of projected water pollution control programs has not been justified by comprehensive planning, evaluated environmental advantages of clean water, or any scientific criteria. They are enjoined by simple rules-of-thumb and verbal criteria embodied in Federal legislation. Planning under the Water Resources Council has either not considered water quality or included arbitrarily prepared programs. Environmental impacts of future situations can only be properly evaluated if cognizance is taken of unrecorded pollution as well as recorded effluents. There is a great lack of data and of methodology of investigating environmental impacts; and the Federal Government, which should take the lead in making such investigations, has passed the responsibility back to the states and private institutions.
W73-13078

PESTICIDES, POLLUTION, AND FOOD SUPPLY,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
D. Pimentel.
Environ Biol. Vol 72, No 1, p 1-38. 1972. Illus.
Identifiers: Apples, Birds, Cotton, Fish, *Food supply, Insects, Onion, Peach, Pest, *Pesticides, Pollution, Tobacco, Toxicity, *Insecticides.

An analysis was made of the available data on the extent of pesticides use on crop lands and losses of crops, both treated and untreated. If pesticides were not used, crop losses were estimated to increase 7% (representing $2.1 billion). Overall, except for supplies of crops such as apples, peaches, and onions, most food crops would not be seriously affected by discontinuing use of pesticides. Only 5% of this country's total crop acres receive insecticide treatment, and about half of this is applied to cotton and tobacco acres. Despite the large increases in insecticide use, crop losses due to insect pests are also increasing and are now estimated by the USDA to be nearly 13%. In part, these trends are due to the practice of substituting insecticides for sound bioenvironmental pest controls (e.g., crop rotation and sanitation) and also to higher consumer standards. Although pesticides should not be eliminated, a need exists to treat only when necessary, to reduce aircraft spray drift, and to reactivate sound bioenvironmental controls. Also, additional acreages of some crops could be profitably planted to offset crop losses due to pesticide reduction. Concerning the toxicity of pesticides, the prime danger appears to be to those who apply these poisons. Unfortunately, the available data on long-term, low-level effects of pesticides to public health are inconclusive. Existing levels of pesticide pollution already have been responsible for kills of some species of beneficial insects, fishes, and birds. This serious pollution has occurred when only a small percentage of the crop acres are being treated with pesticides. A systems approach to pest management, in which the multiple factors of pests, crop culture, costs, benefits, and risks to environment and health are evaluated, is suggested as meeting the needs of agriculture and society as a whole.--Copyright 1973, Biological Abstracts, Inc.
W73-13104

EFFECT OF WATER REGIME ON THE SUCROSE-ENZYME RELATIONSHIPS OF SUGARCANE DESSICATED WITH PARAQUAT,
Puerto Rico Univ., Mayaguez. Agricultural Experiment Station.
For primary bibliographic entry see Field 03F.
W73-13114

POLLUTION ABATEMENT PROGRAMS IN THE DELAWARE RIVER ESTUARY,
Delaware River Basin Commission, Trenton, N.J.
S. P. Gross.
In: Water - 1972, American Institute of Chemical Engineers Symposium Series No 129, Volume 69, 1973, p 414-421, 9 fig, 4 tab, 11 ref.

Descriptors: *Pollution abatement, *Delaware River Basin Commission, Delaware River, *Waste assimilative capacity, *Water quality standards, Dissolved oxygen, *Interstate commissions, Interstate rivers, *Estuaries, Water pollution control, Abatement, Biochemical oxygen demand, Effluents, Interstate compacts, Oxygen demand, Oxygen sag, Regulation, River Basin commissions, Scheduling, Tidal waters, Waste water, Waste water pollution, Waste water disposal, Waste water treatment, Water pollution, Water pollution effects, Water pollution sources, Water pollution treatment, Water quality, Water quality control.
Identifiers: *Allocations, *Abatement schedules, Water uses, Effluent quality requirements, Compliance, Water quality zones.

The program of the Delaware River Basin Commission (DRBC) to abate pollution in the Delaware River Estuary begun in 1968, which was undertaken to implement water quality standards adopted by the Commission in 1967, is the first to utilize the concept of allocation of stream assimilative capacity. Although abatement measures for most of the nearly 100 waste sources are either in the construction or planning steps, some abatement of waste discharges has occurred, and some minor improvements in stream quality have been observed. The significant features of the program are described, as well as initial, current, and projected waste discharge characteristics and stream quality conditions. (DRBC)
W73-13164

EFFECTS OF TEMPERATURE AND CHEMICAL TREATMENTS ON THE CHEMICAL COMPOSITION OF ALKALINE WATER,
Ministry of Agriculture, Bangkok (Thailand). Rice Dept.
P. Nammuang.
Thai J Agric Sci. Vol 5, No 3, p 203-225. 1972.
Identifiers: *Alkaline water, Ammonium, Calcium, Chemical composition, Hydroxides, Irrigation, Magnesium, Potassium, Salts, *Water chemistry, Water temperature, Chemical treatment.

As water temperature increased from 16 to 32C, the values of Na+, K+, and pH increased while the values of HCO3-, Ca++, Mg++ and electrical conductivity (EC) decreased. The reduction of such alkaline components was small compared to the amount of bases NH4OH, KOH and Ca salts of chloride and sulfate added to the water. The addition of NH4OH without Ca salt was not as effective in precipitating HCO3- and Ca++, regardless of temperature or concentration as was KOH. However, 500 ppm of K added at 32C was required to precipitate all of the bicarbonate. Ca salts added alone were not effective in removing bicarbonate. However, when Ca salts were added with the base at 250 ppm, the bicarbonate was completely removed. The combination of 500 ppm of KOH and Ca salt was the most effective treatment for removing alkalinity from the water. All the bicarbonates and most of the Ca and Mg were removed. The pH, EC, Na, K and use of NH4+ as NH4OH+ Ca salts are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-13191

A LITERATURE SURVEY OF OCEAN POLL TION,
Catholic Univ. of America, Washington, D.C. In of Ocean Science and Engineering
For primary bibliographic entry see Field 05B.
W73-13211

SOCIOLOGICAL CONSIDERATIONS IN I RIGATION WATER MANAGEMENT: FACI PROBLEMS OF WATER QUALITY CONTRO
Colorado State Univ., Fort Collins.
E. Vlachos.
National Conference on Managing Irriga Agriculture to Improve Water Quality, May 16- 1972. Sponsored by the Environmental Protecti Agency, Colorado State University. Proceedin p 285-306, (1972). 6 fig, 3 tab, 23 ref. OWRR 043-COLO (7).

Descriptors: *Irrigation water, *Social aspec *Water management (Applied), *Water qual control, *Return flow, Water delivery, Water d tribution (Applied), Water law, Social change, rigation efficiency, Irrigation systems, Irrigati practices, Salinity, Environmental effects, U banization, Institutional constraints, Water m surement.

Water quality degradation due to poor irrigati practices is being recognized in the western U.S a new context of socio-demographic conside tions, where problems of water manageme supply, utilization, reclamation, and conservati can no longer be solved without asking questi that were formerly avoided. As the largest c sumer of public water supplies, irrigated agric ture in the west is now being questioned seriou by those who ask if the government should p farmers not to till the soil in states with high ra fall while it subsidizes farm irrigation in states w low rainfall. Any discussion of the social aspe involved in water quality management proje must deal with such questions as the future water development projects for new irrigati larger considerations for an understanding agriculture in a changing society, the relations between man, technology, society, and envir ment. Technical recommendations include irri tion efficiencies through water measureme modification of long-established local customs water delivery and use; evaluation of methods treatment of soil salts; a water charge sched that will make the farmer cognizant of the need good irrigation practices; and modernization project facilities such as turnouts and ca linings. (Paylore-Arizona)
W73-13307

WATER PURIFYING APPARATUS,
For primary bibliographic entry see Field 05D.
W73-13326

LIQUID FILTERING APPARATUS,
For primary bibliographic entry see Field 05D.
W73-13327

FLEXIBLE OIL BOOM FOR HIGH SEA,
Hurum Shipping and Trading Co. Ltd., Montr (Quebec). (assignee)
R. A. Fossberg.
U.S. Patent No. 3,740,955, 4 p, 4 fig, 5 ref; Offic Gazette of the United States Patent Office, V 911, No 4, p 1189, June 26, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollutio *Pollution abatement, Equipment, Water pollut control, Water quality control.
Identifiers: *Oil booms.

A curtain of sheet material is deployed in a verti position. Its upper portion is above water with t lower below the water surface. Stiffening me bers are arranged in opposed pairs with the curt wall sandwiched between them. Outriggers are

ched to each side of the boom a short distance elow the water line. Outriggers and stiffening embers are connected in a pivotal manner. The ıter end of each outrigger has means for atching a float. A restraining device allows the ıtrigger to swing between a downward retracted sition adjacent to the stiffener and an operating sition perpendicular to the stiffener. Keels or a anchors are held so they can swing between an per retracted position adjacent the curtain wall d an inclined operating position. The flexible om system is provided with exceptional stability that it will remain in place even during very ugh seas. The curtain wall, preferably made of a nthetic fabric such as nylon, can be coated with substance such as polyvinyl chloride. Both stifners and outriggers are formed of aluminum. ıe fabric of the keel should be an extension of e curtain wall fabric. (Sinha-OEIS)
73-13331

EVICE FOR FENCING AND ABSORBING ONTAMINATING OIL SPILLS ON WATER,
hns-Manville Corp., New York. (assignee)
O. Bogosian.
S. Patent No. 3,739,913, 4 p, 8 fig, 8 ref; Official azette of the United States Patent Office, Vol 1, No 3, p 903, June 19, 1973.

escriptors: *Patents, *Oil spills, *Oil pollution, quipment, *Pollution abatement, Water pollution ntrol, Water quality control.

n elongate open-mesh container is used to surund an oil spill. The contents of the container nsists of a mass of fibrous oil-absorbing materi- The material may be a mixture of glass fibers d cord reclaimed from used tires by a process of redding and separation of the cord from the bber matrix. The flotation material should con- t essentially of expanded polystyrene. A rope tends through the center of the container and rough all containers linked thereby. (Sinha-EIS)
73-13333

PPARATUS FOR ELIMINATING OIL SLICKS ROM LARGE BODIES OF WATER,
P. Donsbach.
S. Patent No. 3,741,391, 4 p, 4 fig, 12 ref; Offil Gazette of the United States Patent Office, ol 911, No 4, p 1300, June 26, 1973.

escriptors: *Patents, *Skimming, *Oil spills, *Oil llution, *Pollution abatement, Equipment, ater pollution control, Water quality control.

ater containing an oil slick is drawn into and ntained within a large tub shaped vessel. Within e vessel the lighter contaminating liquid can be awn off at the top while the clean water is mped away from the lower level. In the bottom the vessel, a tubular sleeve is arranged, to ich is attached laterally a conveying system ich sucks off the water from the confined conninated space. A system of valves for conlling entrance and exit is provided. Special arms e attached to the vessel and to floats which supt the entire device. A floatable ring is capable limited vertical and angular movement with spect to the remainder of the vessel so that it ay assume a middle position between the two uid levels inside and outside the space until the uid that is to be eliminated and some water will w in the space across the upper edge. As soon the layer of liquid to be eliminated is so thick in e confined space that there is no longer any nger that water will be sucked from the confined ace the pumping system is turned on. (Sinha-EIS)
73-13337

CLOGGING IN SIMULATED GLACIAL AQUIFERS DUE TO ARTIFICIAL RECHARGE,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 04B.
W73-13374

LEPTOMITUS LACTEUS (PHYCOMYCETES, OOMYCETALES, SAPROLEGNIACEAE) AS FOOD FOR COOT (FULICA ATRA) AT ARTIFICIAL POND OF DANUBE NEAR OEPFINGEN, (IN GERMAN),
J. Hoelzinger.
Anz Ornithol Ges Bayern. Vol 11, No 2, p 168-175. 1972. Illus. English summary.
Identifiers: Artificial ponds, *Coots, Danube, Fulica-Atra, Green-winged teal, Leptomitus-Lacteus, Domycetales, Phycomycetes, Ponds, Saprolegniaceae, Sphaerotilus-Natans, *Germany (Oepfingen), *Aquatic fungi, Waterbird diets.

In the winter of 1971-1972, coots were observed in an artificial pond in Oepfingen (16 km West of Ulm, West Germany) feeding almost exclusively on the aquatic fungus L. lacteus. Waste water drained from a factory into the Danube 8 km away. The contaminated river water fed the pond and resulted in an intensive bloom of Leptomitus. The fungus attaches itself to objects, but is later broken off by the force of the stream and washed into the pond where it sinks to the bottom in great quantities. Greatest productivity of Leptomitus was always between Nov. and March, at which time coots appeared in great numbers, up to as many as 6320. It is presumed that other water birds also feed on this fungus. Very probably flocks of green-winged teal feed on the aquatic bacterium Sphaerotilus natans, which also blooms in great quantities following the waste water introduction mostly in autumn and spring.--Copyright 1973, Biological Abstracts, Inc.
W73-13387

ADSORBING AND ADHESIVE MATERIALS FOR VIRUS REMOVAL FROM WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 05F.
W73-13389

RADIOACTIVE WASTE MANAGEMENT - A BIBLIOGRAPHY OF PUBLICLY AVAILABLE LITERATURE PERTAINING TO THE USAEC'S HANFORD, WASHINGTON PRODUCTION SITE.
Technical Information Center (AEC), Oak Ridge, Tenn.
For primary bibliographic entry see Field 05B.
W73-13414

ENERGY IMPLICATIONS OF SEVERAL ENVIRONMENTAL QUALITY STRATEGIES,
Oak Ridge National Lab., Tenn.
E. Hirst.
Available from NTIS, Springfield, Va., as ORNL-NSF-EP-53; $4.00 in paper copy, $1.45 in microfiche. Report ORNL-NSF-EP-53, July 1973. 31 p, 2 fig, 9 tab, 49 ref.

Descriptors: *Energy conservation, *Environmental effects, Energy, *Environmental engineering, Environmental sanitation, Waste water treatment, Thermal pollution, Air pollution, Cooling towers, Cost-benefit analysis, Urban sociology, Pollution abatement, Costs, Tertiary treatment, Sewage treatment, Estuarine environment, *Water quality control.

The energy needed to operate fairly stringent environmental protection systems is small relative to total energy use and could be offset by improvements in energy-use efficiency that are indicated. Based on 1970 data, costs of hypothetical systems were: (1) urban passenger traffic (improved emission control offset by automobile redesign and a 10% shift to mass transit), 0.47% net decrease in total U.S. energy consumption; (2) secondary-level sewage treatment, 0.43% increase; (3) solid-waste management (landfills offset by incineration-power utilization and by recycle benefits), 0.97% net decrease; (4) air-pollution control at stationary sources), 1.25% increase; (5) dissipation of power-plant waste heat by cooling towers, 0.24% increase. To minimize piping and pumping in waste water treatment, a small plant (30,000 population equivalents) was assumed. Tertiary treatment is considered unlikely, and costs of water treatment are not included in this breakdown. Secondary treatment may allow marine-life survival and reduce algae growth. (Bopp-ORNL)
W73-13421

WATER TREATMENT FOR HIGH PRESSURE BOILERS,
For primary bibliographic entry see Field 03F.
W73-13440

PREOPERATIONAL CLEANING OF HIGH PRESSURE STEAM SYSTEMS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 03E.
W73-13444

TEMPERATURE PROFILES IN CONDENSERS,
Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 03E.
W73-13445

HEATING AND COOLING IN BATCH PROCESSES,
Proctor and Gamble Co., Cincinnati, Ohio.
T. R. Brown.
Chemical Engineering, Vol 80, No 12, p. 99-104, May 28, 1973. 4 fig

Descriptors: *Design criteria, *Heat transfer, *Mathematical studies, *Temperature, Heating, Cooling, Mechanical engineering, Design, Facilities, Equipment, Heat exchangers, Equations, Time, Heat load, Flow rates, Optimization.

A good understanding of heating and cooling operations of batch processes can minimize the number of design and start-up problems. Several easy-to-use equations are presented for cases in which there is a change of phase in the heat transfer medium and in which there is no change of phase in the transfer medium. These relations allow the following quantities to be calculated as a function of time: (1) batch temperature, (2) heat load or rate of transfer, (3) flowrate for a medium that changes phase, and (4) return or final temperature for the medium that does not change. Some typical design and start-up problems which can occur without this knowledge are discussed, such as insufficient process capacity, insufficient plant-utility capacity, high-cost designs, excessive flowrate of the heat transfer medium or temperature of the heat transfer liquid and poor start ups. The important relations presented are: temperature and time; heat load and time; medium flow rate and time; and medium outlet temperature and time. Computer programs developed from this data provide the ability to make many calculations in a short period of time, which is ideal for the study of alternates and for system optimization. (Jerome-Vanderbilt)
W73-13448

SIMPLIFIED METHOD FOR DETERMINING TOWER DRIFT RATE,
For primary bibliographic entry see Field 05B.
W73-13457

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN FLOW,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
L. G. King, and R. J. Hanks.
Copy available from GPO Sup Doc as EP1.23/2:73-265, $3.45; microfiche from NTIS as PB-222 773, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-265, June 1973. 307 p, 81 fig, 60 tab, 75 ref. EPA Project 13030 FDJ.

Descriptors: *Return flow, *Leaching, *Salinity, *Irrigation practices, *Colorado River Basin, Environmental effects, Water quality, Irrigation, Drainage, Soil water, Management, Drainage effects, Computer models, *Model studies, *Utah.
Identifiers: Return flow quality, On-farm water management, Salt storage, Irrigation scheduling, Salt movement, Irrigation frequency, Irrigation management, Field irrigation studies, Ashley Valley (Utah).

Field studies tested the possibilities for using the unsaturated soil profile including the crop root zone as a temporary salt reservoir and providing excess water for leaching and salt discharge when desired. Two models were developed for describing flow of water and salt through the soil with extraction of water by evapotranspiration. One model was designed for use as an irrigation management tool while the other model was initially intended to provide a detailed understanding of the water and salt flow through the soil. The best management model will probably result from a combination of the two models described. Timing of irrigation was tested as a management variable. With all other conditions the same, the model predicts that as the time interval between irrigations increases, the season totals of salt removed from the root zone, salt remaining in the profile, and water required for leaching tend to level off. However, the irrigation frequency has a significant effect upon when the salt is discharged during the season. Results indicate that managing irrigation for control of return flow quality requires good control of depth and timing of irrigation. Some needs for further research are given. (EPA)
W73-13469

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1970-1971, SECOND ANNUAL ISSUE,
Colorado State Univ., Fort Collins. Dept of Agricultural Engineering.
G. V. Skogerboe, W. R. Walker, D. J. Meyer, and R. S. Bennett.
Copy available from GPO Sup Doc as EP1.23/2:73-271, $3.20; microfiche from NTIS as PB-222 796, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-271, June 1973. 285 p. EPA Project 13030 FVN.

Descriptors: *Fertilizers, Irrigated land, Irrigated systems, *Irrigation water, *Nitrates, *Phosphates, *Return flow, Salinity, Water pollution effects, Water pollution sources, Water quality control, Abstracts, *Bibliographies.

Research related to the quality of irrigation return flow is being conducted at numerous institutions throughout the western United States. Related work is also underway at other institutions in the United States, as well as other portions of the world. Approximately 100 sources of material have been searched for articles pertinent to the National Irrigation Return Flow Research and Development Program. These articles describe water quality problems resulting from irrigated agriculture, potential technological solutions for controlling return flows, recent research pertinent to return flow investigations, and literature associated with institutional constraints in irrigation return flow quality control. This second annual issue of SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS contains approximately 450 abstracts of documents published in 1970 and 1971. Author and subject indexes are included. (EPA)
W73-13472

RESEARCH NEEDS ON WASTE HEAT TRANSFER FROM LARGE SOURCES INTO THE ENVIRONMENT.
Illinois State Water Survey, Urbana.

December 1971. 37 p. GI-30971.

Descriptors: *Thermal powerplants, *Thermal pollution, *Environmental effects, *Heat transfer, Research and development, Electric power production, Heated water, Discharge (Water), Wastes, Cooling towers, Ponds, Lakes, Rivers, Biology, Biological community, Atmosphere, Meteorology, Evaluation, Technology, Management.

The data discussed and the findings and recommendations of a conference held at Zion, Illinois on September 20-24, 1971 are presented. A group of 27 experts from a broad cross-section of professional activities reviewed the knowledge of present and projected environmental effects resulting from large injections of waste heat into the environment by means of cooling towers, cooling ponds, lakes, and streams. Areas of research priority determined were: the social and economic pressures related to the installation of new technology; the biological consequences of the addition of waste heat to the environment; the effects of additional heat on atmospheric conditions; the establishment of effective predictive methods for the hydrological conditions brought on by the discharge of waste heat; and the technological developments which have recently occurred. Ways to achieve management and coordination of research efforts were presented. The need for additional environmental data, a clearing house for coordination of the data, education of the public, and interdisciplinary team research were emphasized. (Jerome - Vanderbilt)
W73-13473

ENVIRONMENTAL LEGISLATION: HOW IT AFFECTS FOSSIL-FUEL-FIRED POWER--GENERATING EQUIPMENT,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 06E.
W73-13474

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX H--WATER SUPPLY AND QUALITY CONTROL.
Federal Water Quality Administration, Chicago, Ill. Great Lakes Region.
For primary bibliographic entry see Field 06B.
W73-13488

ESTABLISHMENT OF INVERTEBRATE COMMUNITIES ON LOG SUBSTRATES IN THE KASKASKIA RIVER, ILLINOIS,
Illinois State Natural History Survey, Urbana.
For primary bibliographic entry see Field 05C.
W73-13508

MAINTENANCE OF GREAT SOUTH BAY AND PATCHOGUE RIVER, NEW YORK, NAVIGATION PROJECT (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08B.
W73-13524

THE PRESIDENT'S 1973 ENVIRONMENTAL PROGRAM.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06G
W73-13528

TREATMENT OF ACID MINE WATERS,
Rohn and Haas Co., Philadelphia, Pa
For primary bibliographic entry see Field 05F.
W73-13549

AN OVERVIEW OF WATER MANAGEMENT PROBLEMS,
Greeley and Hansen, Chicago, Ill.
C. W. Reh.
Journal Water Pollution Control Federation, Vol 43, No 12, p 2331-2337, Dec. 1971.

Descriptors: *Water resources, *Management, Public relations, Financing, Water quality control, Administration, Water management (Applied).

Five main problem areas associated with water resource management are discussed. Public demand problems center attention on reaction to available information and the resulting greater awareness of the public. Alternatives lead to problems of the decision-making process, while other problems stem from the new attention given the persons who have quietly pursued the task of managing the environment. The remaining problems include financing -- how to fund and allocate needed projects; and organization -- determining which governmental branch should take the responsibility in matters concerning water quality control. (Bean-AWWARF)
W73-13551

BEHAVIOR OF DETERGENTS (ABS), BACTERIA, AND DISSOLVED SOLIDS IN WATER--SATURATED SOILS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-13560

WATER REQUIREMENTS OF THE PETROLEUM REFINING INDUSTRY,
Maryland Univ., College Park.
For primary bibliographic entry see Field 03E.
W73-13561

PRELIMINARY REPORT ON THE DISPOSAL OF OIL-FIELD BRINES IN THE RITZ-CANTON OIL FIELD, MCPHERSON COUNTY, KANSAS,
Bureau of Mines, Bartlesville, Okla. Petroleum Experiment Station.
C. J. Wilhelm, and L. Schmidt.
U.S. Bureau of Mines Report of Investigations No 3297, December 1935. 20 p, 15 ref.

Descriptors: *Brine disposal, Waste water disposal, *Injection wells, Streamflow, Chlorides, *Saline water intrusion, *Kansas.
Identifiers: *Petroleum industry, Dilution, Disposal in streams, *Salt water reservoirs.

The return of brines to their original subsurface formations is one of the methods by which positive disposal of brine is accomplished. Subsurface disposal is not always possible because of various difficulties encountered, but it is thought that where the formation has porous streaks large volumes of brine may be returned successfully upon proper preparation. It was found that all wells drilled for oil or gas in the test area should be completely cemented in order to prevent possible future contamination. Tests to determine the effects of back pressure on wells producing large volumes of salt water were recommended. Controlled dilution of brine by dumping into surface streams was seen as a disposal possibility for a part of the brine production in the area studied. (Campbell-NWWA)
W73-13564

ESIGN OF CASINGS AND SCREENS FOR 'ATER PRODUCTION AND INJECTION 'ELLS,
loss (Roscoe) Co., Los Angeles, Calif.
or primary bibliographic entry see Field 08B.
'73-13568

CHEMICAL APPROACH TO THE PROBLEM F ENVIRONMENTAL CONTAMINATION,
or primary bibliographic entry see Field 06G.
'73-13586

OLUTE SEPARATION BY CONTINUOUS BUB-LE FRACTIONATION,
utgers - The State Univ., New Brunswick, N.J.
or primary bibliographic entry see Field 05D.
'73-13638

ONTINUOUS BUBBLE FRACTIONATION: ART I, THEORETICAL CONSIDERATION,
alspan Corp., Buffalo, N.Y.
or primary bibliographic entry see Field 05D.
'73-13639

ONTINUOUS BUBBLE FRACTIONATION: ART II, EFFECTS OF BUBBLE SIZE AND GAS ATE,
alspan Corp., Buffalo, N.Y.
or primary bibliographic entry see Field 05D.
'73-13640

ONTINUOUS BUBBLE FRACTIONATION: ART III, EXPERIMENTAL EVALUATION OF OW PARAMETERS,
alspan Corp., Buffalo, N.Y.
or primary bibliographic entry see Field 05D.
'73-13641

VALUATION AND DEVELOPMENT OF HYSICAL-CHEMICAL TECHNIQUES FOR HE SEPARATION OF EMULSIFIED OIL ROM WATER,
alspan Corp., Buffalo, N.Y.
or primary bibliographic entry see Field 05D.
'73-13642

N ACT PROHIBITING THE POLLUTION ISCOLORATION, CONTAMINATION, OGGING, OR DIVERSION OF PUBLIC REAMS.
or primary bibliographic entry see Field 06E.
'73-13650

6. WATER RESOURCES PLANNING

A. Techniques of Planning

TTITUDES OF RIPARIANS TOWARDS THEIR AKE ENVIRONMENTS: A STUDY OF LAKE YOLA AND DAMON POND, MAS-ACHUSETTS,
assachusetts Univ., Amherst. Dept. of Land-ape Architecture.
H. Martin, and L. G. Wegkamp.
vailable from the National Technical Informa-n Service as PB-222 485, $3.00 in paper copy, .45 in microfiche. Massachusetts Water sources Research Center Completion Report '-73-10, June 1973. 41 p. OWRR A-031-MASS).

escriptors: Planning, *Aesthetics, Economics, stitutions, *Massachusetts, *Lakes, Lake ores, *Recreation, Lake morphology, *At-udes.
entifiers: *Vacation homes.

This substudy hypothesized that irrespective of supply and demand, determinants exist which establish preferences for certain vacation or second home sites. Amongst these preferences are: proximity to unpolluted water with recreation potentials; a non-urban setting, preferably a wilderness area accessible to the permanent home location; a setting of some natural beauty with a combination of vegetative and topographical variety. Two lakes were selected to test the first variable, taking care to ensure all the other variables were held constant. The study found that (a) considerable recreational limitations occurred on the polluted lake due to physical and psychological factors (b) respondants were adverse to admitting that water was polluted and in any event discounted the deleterious environment effects of polluted water (c) configuration of shoreline, topography, orientation and access were noted as determinants of house location (d) morphology of water body interaction of shore configuration and water surface suggests important locational determinants and stimuli for community growth (e) building condition and building location are not necessarily functions of supply and economic factors.
W73-13007

DETERMINATION OF OPTIMAL MULTIPLE USES OF A SMALL WATER RESOURCE,
Massachusetts Univ., Amherst. Water Resources Research Center.
C. A. Carlozzi, W. Bellows, P. J. Godfrey, J. C. Mawson, and J. R. Vilkitis.
Available from the National Technical Information Service as PB-222 524, $5.25 in paper copy, $1.45 in microfiche. Completion Report FY73-8, May 1973. 168 p, 10 fig, 34 tab, 120 ref. OWRR B-004MASS (7). 14-01-0001-1510.

Descriptors: *Optimal development plans, Water pollution, Industrial water, Ecology, Invertebrates, *Benthos, System analysis, *Input-output analysis, *Wildlife, *Watershed management, *Massachusetts, Water demand, Statistical methods, *Computer programs, Vegetation, Biota.
Identifiers: *Millers River Watershed (Mass), Connecticut River (Mass), Diversity indices, Factor analyses.

SYMAP, a computer graphic program for data storage and retrieval with a map print out was tested for its applicability in planning. The study area chosen was the Millers River Watershed. A number of sub-problems were studied including overall economics; the economics of the wood using industries; industrial and municipal water use; the effects of pollution on aquatic biota; the role of vegetation and vegetation management as seen by the wildlife manager; and the aesthetic-cultural characteristics of land and water use. The analysis of the role of vegetation and vegetation management involved the only effort to directly use SYMP. The results of the study of aquatic biota produced a new program, DIVERSE, which promises to have application in the analyses of mixed species populations. In an adaptation of input-output analysis, water demand was demonstrated to be a predictable function of output data.
W73-13009

REGIONAL WATER RESOURCE PLANNING FOR URBAN NEEDS: PART II (APPENDICES),
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau, K. Elfers, S. Nicolson, and K. Takeuchi.
North Carolina Water Resources Research Institute, Raleigh Report No 77 (UNC-WRRI-73-77), March 1973. 88 p. OWRR B-021-NC (3) and B-045-NC (2). 14-31-0001-3313. 14-31-0001-3624.

Descriptors: *Planning, *Alternative planning, *Water supply, *Water pollution control, Regional analysis, Model studies, Simulation analysis, Methodology, Optimization, Inter-basin transfers.
Identifiers: *Urban water resources.

Appendices including methodology used in employment projections, water resource simulation model, optimal control of multi-unit inter-basin water resource systems, statistics and models of streamflow, and water quality model. (See also W73-07819)
W73-13015

A PROCEDURE FOR ASSESSING WATER RESOURCES FOR URBAN PLANNING,
Geological Survey, Washington, D.C.
D. A. Rickert, W. J. Schneider, and A. M. Spieker.
Water Resources Bulletin, Vol 9, No 4, p 768-792, August 1973. 3 fig, 3 tab, 3 ref.

Descriptors: Water resources development, *Data collections, *Planning, *Urbanization, *Hydrologic data, *City planning, Water management (Applied), Urban hydrology, Runoff, Low flow, Peak discharge, Urban runoff, Groundwater, Hydrogeology, Water supply.
Identifiers: *Urban planning.

A data-organization chart in the form of a matrix may be used to guide the assessment of urban water resources. The matrix provides a means for determining the relative importance of water-related problems, and for identifying the data needed to evaluate these problems for the purpose of urban planning. The matrix columns list nine categories of potential water-related urban problems. The rows list 51 categories of data inputs which may be needed to evaluate the potential problems. The inputs include standard types of basic hydrologic data, information based on analysis and interpretation of these data, and information on the interfacing factors of climate, land, and culture. A system is described for ranking the relative importance of the problem categories and data inputs on a numerical scale of 0 to 3. From this, an index is derived that evaluates the relative importance of each input item to an overall program for water resource assessment. From the completed matrix the hydrologist can determine the availability of data to meet the identified requirements. Judgement can then be made as to priorities on work elements to provide the planner with maximum information in minimum time. The matrix also provides a basis for the development of programs and their funding in order to overcome critical data deficiencies. (Knapp-USGS)
W73-13035

THE COASTAL ZONE AS AN INTEGRAL ELEMENT OF WATER-RESOURCE SYSTEMS,
Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 02L.
W73-13036

SOME PROBLEMS IN STOCHASTIC HYDROLOGY,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 02A.
W73-13039

A MINIMUM COST WATER DISTRIBUTION NETWORK,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13071

DESIGN OF OPTIMAL WATER DISTRIBUTION NETWORKS USING DYNAMIC PROGRAMMING,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13072

AN INTERACTIVE DESIGN SYSTEM FOR WATER DISTRIBUTION NETWORKS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13073

A STOCHASTIC MODEL FOR THE OCCURRENCE OF MOISTURE IN VADOSE MEDIA,
Clemson Univ., S.C.
For primary bibliographic entry see Field 02G.
W73-13074

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07A.
W73-13075

COMPUTER PROGRAMS IN HYDROLOGY,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 07C.
W73-13076

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II.
For primary bibliographic entry see Field 04A.
W73-13134

NATURAL REGIME HYDROLOGICAL NETWORK PLANNING, A METHODOLOGICAL DISCUSSION,
Waterloo Univ. (Ontario).
S. I. Solomon.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 473-492, (1972) 3 fig, 2 tab, 17 ref.

Descriptors: *Hydrologic systems, *Networks, *Planning, *Optimization, *Dynamic programming, *Hydrologic data, Economics, Design, Costs, Benefits, Operating costs, Flow, Canada.
Identifiers: Least cost, Multivariate minimization, Steepest descent method.

Presented is a method for optimizing the extension and operation of the natural regime network in areas not designated or designated for development, applied to hypothetical conditions in Canada. The methodology is based on the idea that hydrological networks consist not only of stations' time series of data, but also of a system of processing these data to obtain hydrological information, and time series of hydrological data at any point of the area covered by the network. The methodology consists of two distinct but related optimization processes, according to the prospectives of economic development of the area considered. The first process, applicable to that area not planned for development, involves determination of the main network characteristics which would optimize the network according to its internal objectives, such as least cost. The network according to its internal objectives, such as least cost. The technique applicable in this process is the multi-variate minimization by steepest descent method. The second optimization technique used, dynamic programming, is applicable to planning the natural regime network in which development is foreseen. This planning requires a forecast of the economic development and relationships between the errors of estimate of the hydrological characteristics and the losses incurred in the developments envisaged. Obtained is the optimum variation of network characteristics which would produce the largest benefit. (See also W73-13134) (Bell-Cornell)
W73-13136

THE LINEAR DECISION RULE IN RESERVOIR MANAGEMENT AND DESIGN, 3, DIRECT CAPACITY DETERMINATION AND INTRASEASON CONSTRAINTS,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 04A.
W73-13138

MODELLING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FUTURE WATER SUPPLIES,
Sun Oil Co., Dallas, Tex.
For primary bibliographic entry see Field 04A.
W73-13140

DESIGN OF EXPERIMENTS FOR ESTIMATING PROCESS DYNAMICS,
Queen's Univ., Kingston (Ontario). Dept. of Mathematics.
For primary bibliographic entry see Field 04A.
W73-13147

THE IMPACT OF WATER RESOURCES ON THE LOCATION OF ECONOMIC ACTIVITIES,
Technische Hochschule, Munich (West Germany).
For primary bibliographic entry see Field 06D.
W73-13149

SUBJECTIVE PLANNING: A MODEL FOR WATER RESOURCE DEVELOPMENT,
General Telephone Co. of the Southwest, San Angelo, Tex.
T. C. Erskine, and C. S. Shih.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 714-728, (1972). 6 tab, 15 ref.

Descriptors: *Water resources development, *Planning, *Decision making, *Optimum development plans, Methodology, Water supply, Municipal water, Model studies, *Texas.
Identifiers: *Urban water resources, *Bayesian methods, *San Angelo (Tex), Arid regions, Utility theory, Decision theory.

Presented is an analysis for optimum decision-making based on utility concepts to form an adaptive procedure for the planning and control of urban water resources. Decision and utility theory have the ability to evaluate unquantifiable factors or concepts. Employment of this logical decision procedure is very adaptable to environmental problems. These concepts attempt to include intagible factors relevant in the evaluation of alternatives in addition to monetary considerations, such as cost and profit. A method is given for determining a consensus of group opinion and its application within the framework of decision theory. The decision analysis technique is appropriate for problems of municipalities in arid regions. A procedure is presented for the use of subjective data in a decision situation related to urban water resource development. This is accomplished by developing a utility function for available courses of action and evaluating these in a logical and systematic manner. This approach to decision making is then applied, using a method for obtaining a group consensus, to the planning and water resource development problems confronting San Angelo, Texas, a city suffering from recurring problems in obtaining an adequate water supply. (See also W73-13134) (Bell-Cornell)
W73-13150

PROBLEMS OF WATER RESOURCE DEVELOPMENT IN THE GULF COAST ESTUARINE ZONE,
Forest Service (USDA), New Orleans, La. Southern Forest Experiment Station.
For primary bibliographic entry see Field 02L.
W73-13152

SOME POSSIBLE CHANGES IN FUTURE SOCIAL VALUES AND PRIORITIES: STRATEGIC IMPLICATIONS FOR WATER RESOURCES PLANNING,
Institute for Water Resources (Army), Alexandria, Va.
For primary bibliographic entry see Field 06B.
W73-13153

A REPORT ON CORPS OF ENGINEERS RESEARCH ON THE MANAGEMENT OF UNCERTAINTY IN WATER RESOURCES PLANNING,
Decision Sciences Corp., Jenkintown, Pa.
For primary bibliographic entry see Field 06B.
W73-13155

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05D.
W73-13156

DRY FARMING: UNCERTAINTY IN LAND AND WATER PRODUCTIVITY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 03F.
W73-13160

OPTIMAL DESIGN STRATEGY FOR SMALL FLOOD-CONTROL STRUCTURES,
Queen's Univ., Kingston (Ontario).
For primary bibliographic entry see Field 08B.
W73-13161

THE SENSITIVITY OF RETURN PERIODS TO VARIATIONS IN RETENTION LEVELS FOR DIFFERENT DEFINITIONS OF SHORTAGE,
Lancaster Univ., Bailrigg (England).
For primary bibliographic entry see Field 04A.
W73-13162

CONCERNING THE CALCULATION OF LEVEL VERIATION OF CUTOFF WATER BALANCE,
Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
For primary bibliographic entry see Field 04A.
W73-13163

DECISION MAKING IN WATER RESOURCE ALLOCATION,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 06B.
W73-13301

6B. Evaluation Process

INSTITUTIONAL REQUIREMENTS FOR OPTIMAL WATER QUALITY MANAGEMENT IN ARID URBAN AREAS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-13002

EVALUATION OF DISCONTINUITIES IN REGIONAL POPULATION PROJECTIONS,
Massachusetts Univ., Amherst. Dept. of Sociology.
J. Wilkie, and E. Lee.
Available from the National Technical Information Service as PB-222 543, $3.00 in paper copy, $1.45 in microfiche. Massachusetts Water Resources Research Center, Completion Report No FY-73-9, June 1973. 24 p, 2 tab, append. OWRR A-024-MASS (1). 14-31-0001-3021.

escriptors: Population, *Migration patterns, Employment opportunities, Labor mobility, Density, Statistical methods, Regression analysis, Model studies, Community development, Social aspects, Distribution patterns, Cities, *Regional economics, Forecasting, Income distribution, Resource allocation, *Human population.
Identifiers: *Demography, *Urban ecology, *Outmigration, State economic areas, Level of living, Population composition, Factor analysis.

It is postulated (1) that water resource needs are importantly affected by both size and composition of population dispersion, and (2) that migration patterns are the major sources of uncertainty in predicting population change. A predictive model of migration behavior was studied. Using principally multiple regression analysis on migration across State Economic Area boundaries in the form of out-migration rates for 1949-50, it is concluded that migration rates are a dynamic phenomenon dependent primarily on accessibility (transportation, communication, information, distance) and available opportunity (employment rates, income, amenities). However where accessibility is low (e.g., poor communication, great distance) out-migration is not significantly affected by differential opportunity. Also, accessibility variables were only effective when outmigration to nearest neighboring metropolitan area was considered. For out-migration to more distant areas, other accessibility variables were inconclusive. Finally, trait specific composition of community populations (color, age, education) was found not to effect out-migration rates; however, relative size of trait-specific groups effected out-migration of that group. A strong case is made for better statistical data. An appendix provides factor-analyzed characteristics with a table showing which factors may be deleted from analysis in favor of corresponding variables worth retaining. (Kaynor-Massachusetts)
W73-13006

ATTITUDES, VALUES, AND PERCEPTIONS IN WATER RESOURCE DECISION-MAKING WITHIN A METROPOLITAN AREA,
Massachusetts Univ., Boston. Dept. of Political Science.
W. R. Kaynor, and I. Howards.
Available from the National Technical Information Service as PB-222 523, $4.50 in paper copy, $.45 in microfiche. Massachusetts Water Resources Research Center, Publication No 29, June 1973. 147 p, 1 map, 34 tab, 159 ref, append. OWRR B-018-MASS (1). 14-31-0001-3291.

Descriptors: Water resources development, Decision making, *Regional analysis, *Institutional constraints, Planning, *Attitudes, Political aspects, Local governments, *Massachusetts, Connecticut River, Urbanization, *City planning.
Identifiers: Springfield-Chicopee-Holyoke Standard Metropolitan Statistical Area, Interviewing methods, Interest groups.

Two years of research are reported on the water resource decision-making process in the Springfield-Chicopee-Holyoke Standard Metropolitan Statistical Area (Connecticut River valley in Massachusetts). Decision-making was found to be contained by local jurisdictional fragmentation, citizen and official lack of interest in regional water resource problems, and perceptual distortion of the facts relating to water resource problems and plans. Conflicts between groups with mutually incompatible interests did not appear to be a significant constraint. A specific method is described for identifying 'interested and involved' participants in the decision-making process. With rough statistical correlational techniques, an apparent relationship is shown between respondent background characteristics (type and location of community of residence, employment classification, political party affiliation, and type of specialized education) and attitudes, values, or perceptions of water resource issues. The annotated bibliography of 37 pages covers much of the relevant literature through 1969. Recommendations include more formal metropolitanization, better water resource information dissemination, formalization of the role of consultants, maintenance of certain aspects of decentralized decision-making, and better specification in environmental impact statements of the metropolitan area effects of upstream water resource programs.
W73-13008

METHODOLOGY FOR ASSESSMENT OF URBAN WATER PLANNING OBJECTIVES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 03D.
W73-13017

A COMPARISON OF CONSUMER'S SURPLUS AND MONOPOLY REVENUE ESTIMATES OF RECREATIONAL VALUE FOR TWO UTAH WATERFOWL MARSHES,
Utah Center for Water Resources Research, Logan.
C. H. Brink.
Available from the National Technical Information Service as PB-222 544, $4.75 in paper copy, $1.45 in microfiche. Completion report June 1973. 153 p, 11 fig, 26 tab, 41 ref, 5 append. OWRR B-015-UTAH (1). 14-31-0001-1562.

Descriptors: Recreation, Benefits, *Recreation demand, *Marsh management, Waterfowl, *Nonconsumptive use, *Utah, Hunting, Use rates, Expenditures, Income, *Cost comparisons.
Identifiers: Farmington Bay Waterfowl Management Area, Bear River Migratory Bird Refuge, Recreation benefits, *Waterfowl hunting.

Demand curves were estimated for waterfowl hunting and nonconsumptive recreational use from use rate and variable expenditure data collected at the Bear River Migratory Bird Refuge and the Farmington Bay Waterfowl Management Area during FY 1969. Consumer's surplus and monopoly revenue estimates were then derived from the demand functions. Adjusted estimates of consumer's surplus for waterfowl hunting amounted to $7,260 per year at Bear River and $11,400 per year at Farmington Bay. For nonconsumptive recreation annual consumer's surplus was estimated to be $18,700 at Bear River and $3,760 at Farmington Bay. Monopoly revenue estimates were between one-half and one-fourth the corresponding consumer's surplus estimates. The capitalized value (at 8% interest) of predicted annual consumer's surplus for all recreation was $865,000 for Bear River and $299,000 for Farmington Bay. Capitalization of the corresponding monopoly revenue estimates gave $276,900 for Bear River and $92,100 for Farmington Bay. At 3% interest, the capitalized consumer's surplus values increase to $4,242,000 for Bear River and $1,184,000 for Farmington Bay, while those for monopoly revenue increase to $1,330,000 for Bear River and $350,000 for Farmington Bay. Consumer's surplus estimates are more valuable than monopoly revenue estimates for comparison with other values included in the benefit/cost analysis of water development projects because the needed values include more than a nondiscriminating monopolist can extract.
W73-13018

A PROCEDURE FOR ASSESSING WATER RESOURCES FOR URBAN PLANNING,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06A.
W73-13035

THE COASTAL ZONE AS AN INTEGRAL ELEMENT OF WATER-RESOURCE SYSTEMS,
Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 02L.
W73-13036

CHANGING TIMES FOR WATER RESEARCH AND TECHNOLOGY TRANSFER,
Nebraska Univ., Lincoln. Water Resources Research Inst.
W. Viessman, Jr., and K. E. Stork.
Water Resources Bulletin, Vol 9, No 4, p 647-654, August 1973. 4 ref.

Descriptors: *Research and development, *Water resources research act, Environment, Ecology, Planning, Social aspects, Legal aspects, Water management (Applied).
Identifiers: *Technology transfer.

In recent years, important changes have occurred in water resources research. There have been major shifts in attitudes of Congress, state legislatures, and the general public toward water and related resource issues. Future water research and development will have to be environmentally oriented. Emphasis is shifting to research productivity. To justify research expenditures, hard facts must be produced which demonstrate payoff. Technology transfer (getting research results into the hands of users in an understandable and usable form) is gaining prominence. Research projects must be designed for total problem solution and technology transfer must be incorporated as a part of project objectives. Research must be planned and conducted to meet users' needs. Guidelines for modern research design and technology transfer are presented. (Knapp-USGS)
W73-13038

PRELIMINARY STUDY OF POTENTIAL SITES FOR WATER-SUPPLY RESERVOIRS IN WEST AND SOUTHEAST ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06D.
W73-13041

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II.
For primary bibliographic entry see Field 04A.
W73-13134

ESTIMATING BENEFITS TO IMPROVED SEASONAL WATER SUPPLY FORECASTS: A CASE STUDY OF IRRIGATION BENEFITS,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 03F.
W73-13143

STRATEGIC UNCERTAINTY AND THE NATIONAL ENVIRONMENTAL POLICY ACT,
Environmental Defense Fund, East Setauket, N.Y.
L. M. Eisel.
In: Proceedings (Vol. II), International Symposium for Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 696-712, (1972). 19 ref.

Descriptors: *Water resources development, *Decision making, *Project planning, *Forecasting, Benefits, Costs, Feasibility, *Risks.

Water resource developments are traditionally designed to be of service over long periods of time, often exceeding 100 years. The time stream of benefits and costs of such projects will be influenced by many factors difficult to forecast at present, such as future demands for project out-

puts, future importance of natural environments, and changes in institutions and policies. The uncertainty arising from the inability to forecast such future developments is termed 'strategic uncertainty.' Discussed is the problem of inadequate consideration of strategic uncertainty in decisions concerning water resource projects, due greatly to the close relationship between project beneficiaries, federal construction agencies, and Congress, and to the lack of internal and external forces requiring these factions to do otherwise. The National Environmental Policy Act of 1969 (NEPA) is an important vehicle for forcing adequate consideration of strategic uncertainty by water resource development decision makers. Presently, Congress, state governors and agencies, and the general public lack the necessary expertise and resources to provide an effective independent review of proposed water resource developments. NEPA requires federal water resource development agencies to prepare and publish an objective data base on the proposed project and alternatives. (See also W73-13134) (Bell-Cornell)
W73-13148

SUBJECTIVE PLANNING: A MODEL FOR WATER RESOURCE DEVELOPMENT,
General Telephone Co. of the Southwest, San Angelo, Tex.
For primary bibliographic entry see Field 06A.
W73-13150

SOME POSSIBLE CHANGES IN FUTURE SOCIAL VALUES AND PRIORITIES: STRATEGIC IMPLICATIONS FOR WATER RESOURCES PLANNING,
Institute for Water Resources (Army), Alexandria, Va.
G. P. Johnson.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 754-769 (1972). 2 fig, 3 tab, 9 ref.

Descriptors: *Social values, *Priorities, *Water resources, *Planning, Forecasting, United States, *Risks.
Identifiers: *Delphi method, Trends, Change, Cultural evolution, Implications.

Water resources planning in the United States has evolved from a limited purpose engineering function into a complex multi-objective process. During the nation's early growth and development, change was at a slow pace, mirroring the slowly changing structure. Today, however, change is rapid, and new and different trends emerge and can interact to produce many unprecedented variations in the social, economic, and technological environments. This potential for numerous new variations introduces uncertainties of a new and different type that can easily dominate engineering uncertainties associated with the design of physical works. Therefore, the water resources planner of today faces an ever-broadening set of complex issues and must deal with uncertainties of a much more profound nature than in the past. Preliminary results are presented from exploratory research to develop ways to assess the implication of potential changes in social values and priorities on water resources planning. An intuitive forecasting technique--the Delphi method--is employed to identify some potential concerns and priorities that may frame and define water resources requirements of the future. (See also W73-13134) (Bell-Cornell)
W73-13153

TREATMENT OF SOME OF THE UNCERTAINTIES ENCOUNTERED IN THE CONDUCT OF HYDROLOGIC COST-EFFECTIVENESS EVALUATIONS,
North American Rockwell Corp., Downey, Calif. Space Div.
A. D. Kazanowski.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 771-785, (1972). 3 fig, 2 tab, 17 ref.

Descriptors: *Hydrologic systems, *Costs, *Evaluations, *Social aspects, *Technology, *Methodology, *Risks.
Identifiers: *Cost-effectiveness, PERT techniques, Delphi method.

Guides that might be beneficial to reducing some of the uncertainty surrounding the conduct of cost-effectiveness evaluations, particularly of hydrologic systems, are identified and briefly described. The three major sources of uncertainty discussed are associated with determination of goals, selection of criteria, and identification of the uncertainty surrounding cost estimates. Goals for hydrologic systems should reflect both technical and societal considerations. Technical considerations tend to be discrete and readily identifiable, and societal goals tend to be pervasive (based on value systems) and transitory. The pervasive interrelationships of goals can be analyzed through the Delphi technique, relevance trees, or cross-purpose matrices. A methodology is described for determining confidence limits about the total program cost estimate; the procedure uses PERT-type generation of cost statistics and the characteristics of the Beta distribution. A grasp of the uncertainty inherent in a system cost estimate can be obtained through the application of PERT techniques to the cost estimates of the system elements. The 10-step standardized approach presented can provide the basic methodology for conducting cost-effectiveness evaluations of the societal systems or systems with a substantial societal impact; however, the evaluation of these systems requires increased sensitivity and perception into the subtleties of the steps beyond that of the basic methodology. (See also W73-13134) (Bell-Cornell)
W73-13154

A REPORT ON CORPS OF ENGINEERS RESEARCH ON THE MANAGEMENT OF UNCERTAINTY IN WATER RESOURCES PLANNING,
Decision Sciences Corp., Jenkintown, Pa.
J. A. Orlando, and E. W. Weber.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 786-800, (1972). 3 fig, 1 tab, 4 ref.

Descriptors: *Water resources, *Long-term planning, *Methodology, Estimating, Management, *Risks.
Identifiers: Impact, Error, Monetary costs, Non-monetary costs, Knowledge, Information.

The Army Corps of Engineers is sponsoring a number of studies for improving the long-range water resource planning techniques utilized by the Corps' planners. One such study which develops a methodology for management of uncertainty in water resource planning is described. 'Management of uncertainty' refers to dealing with uncertainty in such a way as to reduce the impact of the uncertainty insofar as the consequences of planning decisions are concerned. The nature of the uncertainties and the techniques which are currently being used to meet the problems resulting from the uncertainties are discussed. Then, the approach being taken in this project to identify the uncertainties the planner must deal with, to determine their significance, estimate the 'costs' of the uncertainty, and to estimate the impact of these uncertainties is described. Presented also are some possible methods of using available information and knowledge to reduce the impact of uncertainty in planning. In this study, the 'cost' of uncertainty includes the monetary and non-monetary cost of errors resulting from insufficient information, and the cost of obtaining additional information. (See also W73-13134) (Bell-Cornell)
W73-13155

THE MARGIN OF SAFETY FOR COMPENSATING LOSSES DUE TO UNCERTAINTIES IN HYDROLOGICAL STATISTICS,
Research Inst. for Water Resources Development, Budapest (Hungary).
I. Bogardi, and F. Szidarovszky
In: Proceedings (Vol II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 835-852, (1972) 6 fig, 1 tab, 13 ref.

Descriptors: *Water management (Applied), *Projects, Hydrology, *Statistics, *Design, *Probability, Benefits, Compensation, Damages, Analytical techniques, Flood plains, Methodology, Cost-benefit analysis, Simulation analysis, Mathematical models, Systems analysis, *Risks.
Identifiers: *Margin of safety, Economic losses, Flood levees.

A method is presented for estimating the margin of safety, by which the economic losses due to uncertainties caused by finite length of observation can be minimized in water management projects. Design value is available as a result of earlier economic analysis, or is specified officially. The design probability pertaining to this value is obtained from the distribution function F/h/ estimated on the basis of the n year long record. The value pertaining to the design probability is not an exact one, but its empirical distribution can be determined using a simulation method. If the distribution F/h/ is a normal one, the expected value and standard deviation of distribution for the value pertaining to the design probability can be found by analytical methods. A practical sample is presented and the relations existing between the magnitude of uncertainty and the level of design probability, on the one hand, and the margin of safety and the length of observation on the other, are introduced. The shorter the length of observation available, and the greater the benefits accruing from the project, of the damage averted, and further the higher the level of design probability, the wider the necessary margin of safety. (See also W73-13134) (Bell-Cornell)
W73-13157

POLLUTION ABATEMENT PROGRAMS IN THE DELAWARE RIVER ESTUARY,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 05G.
W73-13164

DECISION MAKING IN WATER RESOURCE ALLOCATION,
Oregon State Univ., Corvallis. Dept. of Anthropology.
C. Brown, J. G. Monks, and J. R. Park.
Oregon Water Resources Research Institute Completion Report, 1972. 143 p, 24 fig, 21 ref, 3 appen. OWRR-B-016-ORE (2).

Descriptors: Water resources, *Resource allocation, *Decision making, *Planning, *Computer models, Data collections, *Oregon, Linear programming, Statistical models, Optimization, River basins, Political aspects, Social aspects, Economics, Watersheds (Basins), Governments, Networks, Mathematical models, Systems analysis, *Water allocation (Policy).
Identifiers: *Economizing techniques, *Willamette River basin (Ore).

A study is reported to delineate, classify and assess the importance and relationship of social-cultural, political and economic inputs to the decision making process in water resources allocation. Standard techniques of data collection and analy-

s were employed throughout the investigation hich studied specifically the Junction City Water ontrol District (JCWCD), located in the Wilmette Valley, Oregon. Major sources of data ere persons living within or associated with adinistration of JCWCD and various local, state, id federal government agency personnel. Of ime significance among study findings was the xistence and interaction of different economizing chniques which actually accomplish the water source allocation. Besides the importance of the icing system with its economic cost benefit conderations, other major economizing techniques democratic, bureaucratic and bargaining power tivities were very much in evidence. A resource location model formulated in terms of network ows, presented problems of assigning value units political and social inputs and changing decision iteria and was ruled impractical. A new linear ogramming model shown to have promise is esented. The judicial system appears to hold uch promise for measuring social outcomes and uld substantially improve resource allocation tivities by broadening the base of benefits and sts to social and cultural values. (Bell-Cornell)
73-13301

ROCEEDINGS OF CONFERENCE ON OWARD A WATER RESOURCES RESEARCH LAN FOR MINNESOTA.
innesota Univ., St. Paul. Water Resources esearch Center.
or primary bibliographic entry see Field 06E.
73-13303

UNCTIONAL AND PSYCHOLOGICAL INEGRATION IN A RURAL COMMUNITY,
nnsylvania State Univ., University Park. Dept. Agricultural Economics and Rural Sociology.
M. Byler.
Sc Thesis, March 1973, 57 p, 23 tab, 35 ref. WRR A-017-PA (1). 14-31-0001-3538.

escriptors: *Flood-control, Reservoirs, Pennsylvania, *Rural sociology, Rural areas, Psychological aspects, Social aspects, *Attudes, Behavior.

his analysis examined the relationship between nctional and psychological integration for inviduals living in a rural Central Pennsylvania mmunity. The nature of integration was subject changes brought about by the construction of a od-control reservoir which physically bisected e original community. Psychological integration as measured by (1) a seven item scale resulting in mean of 94 and a variance of 422 where the west and highest possible values were 7 and 119 spectively (N±430) and (2) self-reported comunity identification. Functional solidarity scores ere derived based on use of services in the intutional areas of retail trade, banking, religion id employment resulting in a mean of 1.2 where e lowest and highest values were 0 and 4 respecvely. Self-reported identification was related sitively at P<.01 with each of the four measures functional integration and the solidarity index. ariations in functional integration were not sigficantly related to variations in the psychological tegration scale scores.
73-13305

OCIOLOGICAL CONSIDERATIONS IN IRIGATION WATER MANAGEMENT: FACING ROBLEMS OF WATER QUALITY CONTROL,
olorado State Univ., Fort Collins.
or primary bibliographic entry see Field 05G.
73-13307

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY: VOLUME I, MAIN REPORT.

Available from UMRCBSCC, 2120 L St NW, Washington, D C 20037, Price $4.00. Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, D C, Vol 1 of 9 volumes, 1972. 133 p, 40 fig, 33 tab.

Descriptors: *Water resources development, *Mississippi River basin, *Projections, Investigations, Reviews, *Evaluation, Aesthetics, Social aspects, Climatology, Meteorology, Hydrology, Surface waters, Groundwater, Geology, Mineralogy, Sediment transport, Water supply, Water quality control, Flood control, Navigation, Recreation, Fish, Wildlife, Powerplants, Agriculture, Water policy, Legal aspects, Economics, *Project planning.

This study was prepared at field level and presents data for a framework program for the development and management of the water and related land resources of the Upper Mississippi River basin. The main report summarizes the findings of the 17 supporting appendices. The water and related land resources of the basin are ample. There are opportunities for further resource development. Conservation and development of the resources are needed if the basin is to maintain its relative position in the national economy. The study presents the needs for water and related land resources and a framework for development of such resources. The estimated total first cost of the recommended framework for development is $28.5 billion of which $13.2 billion is Federal and $15.3 billion is non-Federal. The annual investment ranges from $31 per capita in 1980 to $44 per capita by 2020. The current annual rate of investment is about $27 per capita. Recommendations include approval and adoption of the framework by the Federal Government and the seven basin states, further studies to develop details of the framework, periodic review of the framework, and continuation of the present Coordinating Committee pending organization of the Upper Mississippi River Basin Commission. (See W73-13481 thru W73-13497) (Woodard-USGS)
W73-13480

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX A--HISTORY OF INVESTIGATION.
Corps of Engineers, Chicago, Ill. North Central Div.

Vol 2 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, D.C., Vol 2 of 9 volumes, p A1-A61, 1970. 8 fig, 3 tab, 8 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Projections, Investigations, Reviews, Evaluation, Planning, Economics, Legal aspects, Programs, Hydrology, Surface waters, Groundwater, Fluvial sediments, Agriculture, Meteorology, Mineralogy, Water supply, Water quality control, Navigation, Recreation, Fish, Wildlife, Powerplants, Management.
Identifiers: *Upper Mississippi River basin.

The history, organization, and procedures used by the Coordinating Committee in the preparation of the Upper Mississippi River Comprehensive (Type 1) Basin Study are described. The appendix recounts the history of the study from events leading to the formation of the Coordinating Committee through the completion of the Committee Report. Many representatives of Federal and State agencies and private consultants contributed to the study; their work assignments and tenures are listed. The main topics include history of water resource planning and development, organization and procedures, basic resource studies, economic and legal studies, functional use studies, approach to planning, and information programs. (See also W73-13480) (Woodard-USGS)
W73-13481

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX B--AESTHETIC AND CULTURAL VALUES.

Vol 2 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 2 of 9 volumes, p B1-B374, 1970.

Descriptors: *Water resources development, *Mississippi River basin, *Aesthetics, *Environmental control, Maps, Topography, Vegetation, Surface waters, Groundwater, Wildlife, Land resources, Geology, Soil types, Land use, Water resources, Mapping, Management.
Identifiers: *Upper Mississippi River basin.

As a part of the Upper Mississippi River Comprehensive Basin Study, Appendix B identifies natural environmental systems by showing topography, vegetation, and water areas on maps. Designated on the maps are symbols indicating such natural features as wildlife, vegetation, land forms, water areas and water in motion; and such cultural resources as historic, archaeological, and modern structural developments. Symbols express special features of outstanding or better-than-average quality and are worthy of consideration in advance of developmental planning. This new form of environmental resource inventory can be added as an overlay to the existing basic inventory maps of soil, topography, land use and cover, water resources, etc. The inventory mapping not only identified outstanding natural systems in the watershed, but clearly indicates where present and projected development may well destroy environmental quality. (See also W73-13480) (Woodard-USGS)
W73-13482

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX C--CLIMATOLOGY AND METEOROLOGY.
Army Engineer District, St. Louis, Mo.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p C1-C56, 1970. 40 fig, 13 tab, 34 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Climatology, *Meteorology, Reviews, Meteorological data, Rainfall, Snow, Sleet, Humidity, Dew point, Evaporation, Evapotranspiration, Fog, Water resources, Temperature, Winds, Storms, Hurricanes., Floods, Environmental damage, Forecasting.
Identifiers: *Upper Mississippi River basin.

The various aspects of climate in the Upper Mississippi River basin and the activities of private, local public, state and Federal agencies working in this field are described. Previously published materials are used as sources of information. The climatological and meteorological picture is on a local, state, and regional basis, without regard to river basin boundaries. Consequently, the subject matter is not strictly confined to the basin, but is reasonably representative of it. A glossary of generally unfamiliar terms is included. Normal annual precipitation ranges from about 20 inches in the northwest to about 46 inches in the south. Thunderstorms are the source of a large part of the total precipitation; they are also responsible for

flash floods, lightning, and damaging winds. Lightning annually causes from 2 to 5 deaths per million population and from $3 to $8 million per basin state in losses to farm buildings. Hail, another byproduct of thunderstorms, causes an annual loss of $22 million in livestock, automobiles, and crops in the principal five states of the basin. Generally, runoff into basin streams is adequate because precipitation amounts exceed those losses incurred through the soil by transpiration and evaporation. (See also W73-13480) (Woodard-USGS)
W73-13483

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX D--SURFACE WATER HYDROLOGY.
Army Engineer District, St. Paul, Minn.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p D1-D113, 1970. 50 fig, 8 tab, 26 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Surface waters, *Hydrology, Reviews, Projections, Hydrologic data, Data collections, Streamflow, Runoff, Flow rates, Floods, Peak discharge, Droughts, Base flow, Evaporation, Reservoirs, Water storage, Flood forecasting, Weather forecasting.
Identifiers: *Upper Mississippi River basin.

This appendix (D), contains hydrologic data pertinent to analysis of water and related land resource problems and to the formulation of a comprehensive framework plan for the solution of such problems in the study area. Surface water hydrology, as used in this appendix, can be defined as the measurement, collection, and organization of surface water runoff data and interpretation of results. Runoff data are presented in a variety of ways. Maximum, average, and minimum runoff rates are tabulated for various time intervals. Flow duration, flood frequency, flow storage, and mass curves are included. Infiltration indexes and evaporation data are also included. In conjunction with runoff data several existing the potential reservoir sites have been investigated, and pertinent information relative to these sites is included. (See also W73-13480) (Woodard-USGS)
W73-13484

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX E--GROUND WATER AND GEOLOGY.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p E1-E74, 1970. 22 fig, 12 tab, 119 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Groundwater resources, *Hydrogeology, *Aquifers, Hydrologic data, Geology, Aquifer characteristics, Water wells, Water yield, Water quality, Groundwater recharge, Water utilization, Water supply, Projections, Planning.
Identifiers: *Upper Mississippi River basin.

The groundwater resources of the study area are large and highly developed in a few urban-industrial centers. Those conducting comprehensive basin planning must therefore consider where this resource may be tapped, its adequacy for various categories of use, and how it can be managed to best advantage. This report was prepared in accord with the following specific set of objectives: (1) to present a general description of the groundwater hydrology of the basin, with emphasis on potential sources of large supplies adequate for municipal or industrial use; (2) to present the information in such a manner as to be readily usable in the formulation of long-range plans and as a guide for water management decisions by public water action agencies; and (3) to point out hydrologic factors that have become apparent in earlier studies that should be taken into consideration in formulating water resource management plans. (See also W73-13480) (Woodard-USGS)
W73-13485

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX F--MINERAL RESOURCES.
Bureau of Mines, Twin Cities, Minn. Twin Cities Office of Mineral Resources.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p F1-F122, 1970. 26 fig, 75 tab, 125 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Mineralogy, Metals, Coals, Petrography, Natural resources, Reviews, Gravels, Sands, Clays, Mining, Transportation, Navigation, Environmental effects, Planning, Projections, Management.
Identifiers: *Upper Mississippi River basin.

Mineral resources are described as one part of the comprehensive study of water development and land utilization of the Upper Mississippi River basin. The study estimates mineral resource potential and evaluates solid and liquid mineral fuel production. These factors are related to water use, water availability, and water pollution. The causes and extent of such pollution are investigated and possible corrective measures are offered. In addition, land utilization is studied. All of these factors are evaluated for present conditions and for projections for the future. Mineral resources in the basin may be divided into two groups: export commodities, transported from their origins out of the region; and residentiary commodities, used locally or moved only small distances from their origins. Export mineral commodities are coal, iron ore, lead concentrates, zinc concentrates, industrial sands, dimension stone, natural gas, petroleum, natural abrasives, and some sand and gravel. Residentiary mineral commodities are sand and gravel, crushed stone, marl, clay, shale, and some dimension stone. (See also W73-13480) (Woodard-USGS)
W73-13486

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX G--FLUVIAL SEDIMENT.
Army Engineer District, Rock Island, Ill.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p G1-G100, 1970. 50 fig, 12 tab, 54 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Fluvial sediments, Sedimentology, Sediment transport, Sedimentation, Sediments, Streamflow, Sediment yield, Reservoir silting, Particle size, Sediment distribution, Land use, Sediment control, Erosion control, Planning, Environmental control, Management.
Identifiers: *Upper Mississippi River basin.

A general appraisal is provided of sedimentation and related problems in the study area. This appraisal is made because of the importance of sediment in the overall management of water and related land resources. This includes a definition of the sediment problems, the areal distribution, magnitudes, variability, characteristics of sediment, and trends in sediment yields. The appraisal is based on available data from State and Federal agencies actively engaged in the collection of such data during the last two to three decades. A primary objective is to evaluate the problems in water resources development which have been caused by the presence of sediment in streams and reservoirs, and which will have an important bearing on the future water resources development in the basin. A means is provided to estimate the probable rate of sediment deposition in reservoirs. Information useful in solving sediment problems involving water treatment, damage to land, channels, recreational facilities, reservoirs, and transportation facilities is also provided. The dollar damage from sediment is estimated. (See also W73-13480) (Woodard-USGS)
W73-13487

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX H--WATER SUPPLY AND QUALITY CONTROL.
Federal Water Quality Administration, Chicago, Ill. Great Lakes Region.

Vol 4 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $3.00. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 4 of 9 volumes, p H1-H342, 1970. 20 fig, 212 tab, 112 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Water supply, *Water quality control, Reviews, Planning, Projections, Water demand, Industrial water, Municipal water, Groundwater resources, Surface waters, Water pollution sources, Municipal wastes, Industrial wastes, Agricultural chemicals, Urbanization, Sediments, Water pollution control, Economics, Flow augmentation.
Identifiers: *Upper Mississippi River basin.

Guides are provided to future water resource development in the study area by indicating which subareas have water problems calling for future detailed planning efforts. In addition, the study outlines the characteristics of projected water and related land resource problems and the general approaches that appear appropriate for their solution, consistent with the best use of combination or uses of water and related land resources to meet all foreseeable short- and long-term needs. The study includes: collection of basic data on municipal and industrial water uses and all waterborne wastes; preliminary evaluation of the natural characteristics and capability of surface water to assimilate wastes; and the projections of municipal and industrial water needs and various types of wastes to the year 2020. Using the data collected and the preliminary evaluations as a basis, mathematical projections of total water requirements were made in order to furnish preliminary estimates of the storage needs for municipal and industrial water supply and for quality control water. (See also W73-13480) (Woodard-USGS)
W73-13488

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX I--FLOOD CONTROL.
Army Engineer District, Chicago, Ill.

Vol 5 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $3.00. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 5 of 9 volumes, p I1-I225, 1970. 53 fig, 131 tab, 73 ref.

criptors: *Water resources development, ssissippi River basin, *Flood control, Projec- Flood damage, Agriculture, Flood forecast- Flood data, Flood flow, Flood frequency, d peak, Flood plain zoning, Flood profiles, d protection, Planning.
tifiers: *Upper Mississippi River basin.

Upper Mississippi River Comprehensive n Study will develop a framework plan for the use or combination of uses of water and re- land resources to meet foreseeable short- and long-term needs of the basin. This appen- I) presents an assessment of flood problems in asin; their causes, effects, and possible alter- es for their solution. A framework plan or egy for reduction of flood damages is loped. Opportunities for flood damage reduc- are based on the results of re-analysis of ious Corps of Engineers and Soil Conserva- Service studies, and the evaluation of alterna- neans of development based on a national ef- ncy objective, which results in an economic ation and benefit/cost ratio equal to or better unity. Opportunities for development and ervation of the water resources are analyzed lation to the flood problems in the basin. (See W73-13480) (Woodard-USGS)
-13489

ER MISSISSIPPI RIVER COMPREHENSIVE IN STUDY, APPENDIX J--NAVIGATION.
s of Engineers, Chicago, Ill. North Central

5 available from UMRCBSCC, 2120 L St NW, nington, DC 20037 - Price $3.00. In: Upper issippi River Comprehensive Basin Study rdinating Committee (UMRCBSCC) Report, nington, DC, Vol 5 of 9 volumes, p J1-J115, 29 fig, 32 tab, 29 ref.

riptors: *Water resources development, sissippi River basin, *Navigation, *Inland rways, Planning, Management, Legal cts, Economics, Transportation, Boats, es, Recreation, Boating, Ecology, Fish, Wil- Environmental control.
tifiers: *Upper Mississippi River basin, Com- ial transportation, Commodities.

rmation about the transportation and recrea- l boating use of the Upper Mississippi River 's inland waterways is presented. Estimates ederal, State and local program requirements given for the planning periods 1966, 1980, and 2020. These estimates are of a reconnais- e nature and provide a base for future im- ed technical planning for the development and agement of the basin's navigation system. The nal and reqional transportation are important e projections of waterborne commerce for the . Factors relating to the total volume of all nodities transported, geographic distributions e five principal modes of transportation in the and the region, and individual advantages of transportation system are basic to the lopment of national, multistate, and regional ection of commodity movements. (See also -13480) (Woodard-USGS)
-13490

ER MISSISSIPPI RIVER COMPREHENSIVE IN STUDY, APPENDIX K--RECREATION.
au of Outdoor Recreation, Ann Arbor, Mich. Central Region Office.

5 available from UMRCBSCC, 2120 L St NW, nington, DC 20037 - Price $4.50. In: Upper issippi River Comprehensive Basin Study rdinating Committee (UMRCBSCC) Report, nington, DC, Vol 6 of 9 volumes, p K1-K126, 75 fig, 41 tab, 95 ref.

Descriptors: Water resources development, *Mississippi River basin, *Recreation, *Water sports, Reviews, Planning, Projections, Economics, Human population, *Tourism, *Land use, Topography, *Recreation facilities, Employment, Social aspects, National parks, Management.

Appendix K is a joint cooperative effort of the various state and Federal agencies who served as members of the Recreation Advisory Committee. The consideration of outdoor recreation opportunities is an important aspect of the overall study. Specificially, the outdoor recreation portion of the study seeks to: (1) inventory existing and potential recreation resources in the basin; (2) determine use pressures on existing facilities and the immediate demand for additional developments; (3) establish long-range needs and goals for providing adequate recreational opportunities to the year 2020; and (4) recommend a plan of action or programs for increasing present and future resource capabilities for satisfying recreation requirements. Recreation is a major industry in the basin. It dominates the economies of the tourist destination counties in northern Wisconsin and Minnesota. Recreation adds nearly 1 billion dollars annually to the state's economy. In addition, outdoor recreation provides nearly one-fifth of the total state employment and accounts for over 80 percent of the summer weekend highway peak loads. (See also W73-13480) (Woodard-USGS)
W73-13491

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX L--FISH AND WILDLIFE RESOURCES.
Bureau of Sport Fisheries and Wildlife, Minneapolis, Minn.

Vol 6 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 6 of 9 volumes, p L1-L103, 1970. 23 fig, 23 tab, 33 ref.

Descriptors: Water resources development, *Mississippi River basin, *Fish, *Wildlife, Reviews, Water quality control, *Sport fish, Commercial fishing, Economics, Fisheries, Climates, Vegetation, Soils, Water resources, Human population, Transportation, Agriculture, Industries, Water pollution control, Water quality, *Planning, *Projections.

Appendix L is the joint effort of numerous State and Federal agencies working through a Fish and Wildlife Advisory Committee. Plans for meeting needs for sport fish and wildlife opportunities fall under several broad categories. They are geared in scope and number to the problems of the particular basin subarea. In general, planners, political authorities, and management experts attempt to accomplish the following: (1) increase the utilization of existing resources through improved access, increased acquisition of public-use fish and wildlife facilities near metropolitan areas, greater emphasis on under-utilized species, and creative enhancement techniques on available habitat; (2) firm and immediate correction of degrading pollution problems; (3) better communication between Federal and State conservation agencies and between agencies with varying or conflicting interests in basin natural resources; (4) continued acceleration of research studies on pesticides, thermal effects, and other expanding pollution problems; and (5) preservation of unique environmental systems which will otherwise be lost to future generations. (See also W73-13480) (Woodard-USGS)
W73-13492

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX M--POWER.
Federal Power Commission, Chicago, Ill.

Vol 6 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 6 of 9 volumes, p M1-M68, 1970. 23 fig, 29 tab.

Descriptors: Water resources development, *Mississippi River basin, *Hydroelectric power, Reviews, *Planning, Projections, Electric power demand, Economics, Costs, Human population, *Industries, *Powerplants, Cooling water.

Future electric power requirements and supply in the study area are discussed. The projections of future electric power needs are made, not only to determine the probable effect on the basin economy and use of its natural resources, such as fuel, but to develop estimates of future needs for cooling water. The Upper Mississippi River basin (UMRB) is that portion of the north-central United States encompassing the Mississippi River and all streams draining into it above the Ohio River excluding the Missouri River. The area covers the larger parts of Minnesota, Wisconsin, Illinois, and Iowa; and reaches into Indiana, South Dakota, and Missouri. In 1960 the UMRB Power Region, with an area of 178,000 square miles, had a population of 18,805,477 accounting for 5% of the area of the nation and 10.5% of the population. The average population density of 106 per square mile is slightly more than double the national average. Population density varies considerably within the basin. The total energy requirement for the region in 1960 was less than 100 billion kWh. The projected energy requirement for the year 2020 is more than 1600 billion kWh. (See also W73-13480) (Woodard-USGS)
W73-13493

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX N--AGRICULTURE.
Soil Conservation Service, Washington, D.C.

Vol 6 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 6 of 9 volumes, p N1-N210, 1970. 64 fig, 112 tab, 25 ref.

Descriptors: Water resources development, *Mississippi River basin, *Agriculture, *Crop production, *Planning, Projections, Reviews, Natural resources, Climates, Topography, Geology, Land use, Water resources, Economics, Flood protection, *Irrigation, Groundwater, Surface waters, Water supply, Water quality, Water pollution control.

Appendix N was prepared by the Soil Conservation Service, Forest Service, and Economic Research Service, in the Department of Agriculture. The study of agricultural land and water use and development was based upon an economic analysis which includes consideration for the basin's share of the nation's demand for food, feed, and fiber. This share included projected domestic demands plus export requirements. The methodology recognizes a physical and economic interrelationship between watersheds and subareas and between projects in the plan formulation. This relationship introduces a broader scope to the study than would be obtained if individual areas and projects were considered separately. Three systems were used for delineating subparts of the basin to develop data. These were: (1) hydrologic subareas, (2) basin plan areas, and (3) economic subregions. The planning area of 302 counties in seven states is somewhat larger than the 189,037 square-mile drainage area of the basin. (See also W73-13480) (Woodard-USGS)
W73-13494

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX O--STATE AND

FEDERAL WATER LAWS, POLICIES, AND PROGRAMS.
Corps of Engineers, Chicago, Ill. North Central Div.

Vol 7 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 7 of 9 volumes, 1970. 559 p, 1 fig, 4 tab, 83 ref.

Descriptors: Water resources development, *Mississippi River basin, *Water law, *Water policy, Programs, *Federal Government, *State governments, Water supply, Water demand, Economics, Agriculture, Industries, Urbanization, Public health, Water utilization, Water quality, Water pollution control, Surface waters, Groundwater, Land use, Management, Legal aspects, Water rights, Environmental control.

Appendix O was prepared jointly by the U.S. Army Engineer District, Chicago, and the states of Illinois, Indiana, Iowa, Minnesota, Missouri, South Dakota and Wisconsin. Executive policies, standards, and procedures have been established for uniform application in the formulation, evaluation, and review of comprehensive river basin plans and individual project plans for use and development of water and related land resources. The basic objective in the formulation of plans is to provide the best use, or combination of uses, of water and related land resources to meet all foreseeable short- and long-range needs. In pursuit of this basic conservation objective, full consideration is given to the development, preservation, and well-being of the people. Water laws of the states which are included in the Upper Mississippi River basin are based on the riparian doctrine. This provides that owners of the land along a stream share equally in the use of the water, as long as each riparian owner is reasonable in his use. However, each land owner's right to make reasonable use of the water is limited by the equal right of all other land owners along the same watercourse. (See also W73-13480) (Woodard-USGS)
W73-13495

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX P--ECONOMIC BASE STUDY AND PROJECTIONS.
Vol 8 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $2.00. Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 8 of 9 volumes, 1970. 194 p, 61 fig, 107 tab.

Descriptors: *Water resources development, *Mississippi River basin, *Economics, *Projections, Regional economics, Social aspects, Human population, Labor supply, Wages, Industries, Employment, Agriculture, Land use, Livestock, Forestry, Mineralogy, Electric power industry, Recreation, Navigation, Flood control.
Identifiers: *Upper Mississippi River basin.

The economic base study and projections are presented for developing necessary information regarding the future economic and demographic changes of the study area to serve as guides for the development of water resource requirements or demands. These demands are projected based on the information supplied in this appendix and, together with related materials, will be used as the basis for determining the water and related land resource needs and the required development. Summary statements are included of methodologies proposed for use by Federal agencies and states in developing the demands that have been placed upon water resources based on the projections. On the basis of the data and projections developed, quantitative, qualitative and time-phased requirements for present and future control, use, and conservation of water in related land resources of the basin will be determined by the Federal agencies and states cooperating in this study. The plan to be developed will be for flood control, navigation, hydroelectric power, municipal and industrial water supply, water quality control, recreation, fish and wildlife conservation, agriculture, forestry, and other water related land uses. (See also W73-13480) (Woodard-USGS)
W73-13496

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX Q--FRAMEWORK FOR DEVELOPMENT.

Vol 9 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price $3.00. Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 9 of 9 volumes, 1972. 306 p, 75 fig, 132 tab.

Descriptors: Water resources development, *Mississippi River basin, *Management, Surface waters, Groundwater, Water supply, *Water demand, Natural resources, Water quality, Water pollution control, Land use, Flood control, *Land management, Economics, Legal aspects, Social aspects, Human population, Forestry, Industrial water, Municipal water, Agriculture, Recreation, Fish, Wildlife, Urbanization, Sediments, Erosion control, Urbanization, *Planning, Projections, Programs, Environmental control.
Identifiers: *Regional development guidelines.

A comprehensive framework is presented to solve problems and meet future needs for water and related land resource development in the study area. Guidelines published by the Water Resources Council were followed. These guidelines provided for a preliminary or reconnaissance-type investigation intended to provide broad-scale analyses of water and related land resource problems, and to furnish general appraisals of the probable nature, extent, and timing of measures for their resolution. The Plan Formulation Task Group combined the information included in the sixteen resource appendixes and the individual suggestions in the appendixes into a broad framework for meeting the identified needs. The group also took into account the interacting nature of many requirements in the planning process. The studies in the appendixes define the availability of water and related land resources within the basin. The economic studies describe the present and past population and employment trends of the basin as well as the projected level of the economy and related growth factors. Legal studies summarize the basin information on laws and regulations involving ownership, control, and use of the water resources within the basin. The special purpose studies present an inventory of existing development, determined projected demands for goods and services, and described single-purpose plans to meet identified net needs. The framework is directed towards satisfying the needs of people, and is flexible enough to accommodate variation in need and political choices. (See also W73-13480) (Woodard-USGS)
W73-13497

ECONOMIC CRITERIA FOR DECISIONS ON PRESERVATION AND USE OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
T. R. Gupta.
Journal of Northeastern Agricultural Economics Council, Vol 1, No 1, p 201-210, Summer 1972. 1 tab, 5 ref. OWRR B-023-MASS (4).

Descriptors: *Wetlands, *Conservation, *Land development, *Massachusetts, Reviews, Evaluation, Economics, Social aspects, Environmental effects, Ecology, Recreation, Wildlife conservation, Planning.

The criteria for decisions on preservation or development of inland wetlands in Massachusetts are evaluated. Wetlands may be considered productive habitats for wildlife with both commercial and aesthetic values, of visual cultural values, as buffers against floods, of materials possessing biological and educational values, and of water supply. The quantity and quality of these benefits will depend upon many factors, most important of which are the nature and location of a wetland itself. Contrarily, wetlands in their altered forms are capable of helping production of other economic goods and services such as food, other recreation, housing, commercial and industrial sites, and transportation facilities for which the human race continues to strive under the banner of economic development. In the context of these conflicting aspects of productivity, the necessity of choice among the social values of preserved versus altered use of wetlands exists. The approach here is to examine all potential benefits and costs of preserving wetlands in order to come up with criteria for optimum decisions. (Woodard-USGS)
W73-13518

AN OVERVIEW OF WATER MANAGEMENT PROBLEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 05G.
W73-13551

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

RESERVOIR MANAGEMENT: OPTIMAL PRICING AND RATIONING POLICIES UNDER UNCERTAINTY,
Montpellier Univ. (France). Faculte des Sciences.
For primary bibliographic entry see Field 04A.
W73-13141

TREATMENT OF SOME OF THE UNCERTAINTIES ENCOUNTERED IN THE CONDUCT OF HYDROLOGIC COST-EFFECTIVENESS EVALUATIONS,
North American Rockwell Corp., Downey, Calif. Space Div.
For primary bibliographic entry see Field 06B.
W73-13154

ESTIMATING COOLING TOWER COSTS FROM OPERATING DATA,
For primary bibliographic entry see Field 05D.
W73-13432

6D. Water Demand

EVALUATION OF DISCONTINUITIES IN REGIONAL POPULATION PROJECTIONS,
Massachusetts Univ., Amherst. Dept. of Sociology.
For primary bibliographic entry see Field 06B.
W73-13006

A COMPARISON OF CONSUMER'S SURPLUS AND MONOPOLY REVENUE ESTIMATES OF RECREATIONAL VALUE FOR TWO UTAH WATERFOWL MARSHES,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 06B.
W73-13018

PRELIMINARY STUDY OF POTENTIAL SITES FOR WATER-SUPPLY RESERVOIRS IN WEST AND SOUTHEAST ALABAMA,
Geological Survey of Alabama, University.
L. B. Peirce, J. R. Clark, and W. E. Smith.

vailable from NTIS, Springfield, Va 22151 PB-6 997 Price $3.00 printed copy; $1.45 microfiche. abama Development Office, Montgomery Spe-l Studies Division Planning Report, September 72. 119 p, 2 fig, 1 tab, 11 ref.

escriptors: *Reservoir sites, Water resources velopment, *Water demand, *Potential water pply, *Reservoir storage, *Alabama, Watershed nagement, Water utilization, Planning, Design teria, Projections, River basin development, nicipal water, Industrial water, Recreation, Ir-ation, Navigation, Water quality control, Flood ntrol.

ojections to the year 2020 indicate that the de-nd for water in Alabama could be 7 billion gal-s per day greater than in 1970. Much of this ad-ional water can be made available through more ensive use of groundwater supplies and the ther development of the major rivers, but a sub-ntial part must come from storage reservoirs nstructed on many of the presently undeveloped nor streams. Forty-four potential reservoir sites identified on minor streams in Alabama, exclu-e of the Alabama and the Tennessee River ins. Each site is described with regard to loca-n and various topographic, hydrologic, and logic characteristics pertinent to preliminary ervoir planning and design. Construction of ervoirs at the sites catalogued would provide an regate storage capacity of 3,750,000 acre-feet would add about 200,000 acres to the State's ter surface. The reservoirs would provide a tained yield of about 3.5 billion gallons per day t could be used for municipal, industrial, or icultural water supply or to augment stream-w for navigation or water-quality control. In ad-on, the reservoirs would offer valuable benefits recreation, fish and wildlife conservation, and ome cases flood control. (Woodard-USGS)
3-13041

BLIC AND INDUSTRIAL WATER SUPPLIES NORTHERN MISSISSIPPI,
ological Survey, Jackson, Miss.
. Callahan.
ssissippi Board of Water Commissioners Bul-n 73-1, 1973. 68 p, 7 fig, 20 ref.

scriptors: *Water supply, *Surface waters, roundwater, *Mississippi, *Industrial water, unicipal water, Water utilization, Consumptive , Water wells, Rivers, Well data, Water levels, ter quality, Hydrologic data, Basic data collec-ns.

lic and industrial water withdrawals for the 45 nties of northern Mississippi were more than mgd in 1971. Usage was divided about equally ween public supplies and self-supplied indus-Of the total usage, 6 mgd was from streams. city of Columbus, pumping from Luxapalila ek, is the only public supply using surface er; all other public supplies are obtained from ls. Two million gallons per day of self-supplied strial water is obtained from one stream, the flower River. Producing aquifers range in age n Paleozoic to Holocene. The most widely d aquifers are the Meridian-upper Wilcox and Sparta Sand of Eocene age, but the largest ndrawals, over 50 mgd, are made from the Mis-ippi River alluvium. (Woodard-USGS)
3-13042

SERVOIR MANAGEMENT: OPTIMAL PRIC-G AND RATIONING POLICIES UNDER UN-RTAINTY,
ntpellier Univ. (France). Faculte des Sciences.
primary bibliographic entry see Field 04A.
3-13141

E IMPACT OF WATER RESOURCES ON E LOCATION OF ECONOMIC ACTIVITIES,
hnische Hochschule, Munich (West Germany).
M. J. Beckmann.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 691-695, (1972). 1 fig, 2 ref.

Descriptors: *Water resources, *Economics, Water users, Labor, Energy, Marketing.
Identifiers: *Location theory, *Economic activities.

Water is discussed as an input into production and as a consumption good. It is also discussed in relation to the economic theory of the location of activities, where certain basic principles are set forth that guide the efficient location of economic activities which underly the corrective forces of competitive markets. There can be no doubt that water plays an important role in determining locational choices. It tends, however, to be overshowed by other influences. Thus, water is indispensable as a cooling agent in energy production from fuel resources. But thermal energy production is definitely oriented towards fuel locations including locations to which fuel can be brought cheaply by sea or waterway. (See also W73-13134) (Bell-Cornell)
W73-13149

GEOTHERMAL ENERGY--RESOURCES, PRODUCTION, STIMULATION.
Stanford Univ., Calif. Dept. of Civil Engineering.

Available from Stanford University Press, Stanford, Calif Price $17.50. Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, P. Kruger, and C. Otte, editors, Stanford, Calif, 1973. 360 p.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Power demand.

An assessment is given of the potential of geothermal energy in meeting the increasing energy demand within the United States during the next few decades and in conserving our fossil fuels. Worldwide status, principles of occurrence, resource potential, and exploration techniques of geothermal energy are reviewed. The discussion includes production, forms of utilization, environmental impact, and well stimulation by nuclear, chemical, and mechanical techniques. Geothermal energy will be used largely for the generation of electric power. The nation's geothermal energy resource is potentially vast, particularly the portion that may be tapped by deeper drilling. Most of the resources are of the liquid-dominated type, rather than the vapor-dominated type exemplified by the field at The Geysers, in California. Development of the technology for the vapor-turbine cycle will permit the development of liquid-dominated resources of intermediate-range temperatures (in excess of 300 deg F), and thus vastly increase available geothermal resources. Electric power produced from a geothermal field appears to be economically competitive with that from fossil-fuel stations. The environmental impact of geothermal power development is more acceptable than that of fossil- or nuclear-fuel power development. The United States could be producing at least 132,000 Mw of electric power from its geothermal resources in 1985. (See W73-13215 thru W73-13232) (Knapp-USGS)
W73-13214

INTRODUCTION: THE ENERGY OUTLOOK,
Union Oil Co. of California. Los Angeles.
C. Otte, and P. Kruger.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 1-13, 1973. 2 fig, 4 tab, 10 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Power demand.

During the period 1971-85 energy consumption in the United States is forecast to grow at an average rate of 4.2% per year. Domestic supplies will grow at an average rate of 2.6% per year. By 1985 domestic supplies will satisfy only about 70% of U.S. consumption. In order to meet growing demands for pertroleum liquids, imports would have to increase more than fourfold by 1985. Potential gas demand would approximately double between 1970 and 1985. Dependence on imports would rise from 4% of gas supplies in 1970 to more than 28% in 1985. The supply of domestic coal, including exports, will increase from 590 million tons in 1970 to some 1,071 million tons in 1985. Coal reserves are ample and could support a faster growth rate in production. By 1985 nuclear energy will be supplying 48% of total electric power requirements. The remaining fuels--hydroelectric power, geothermal power, and crude oil from shale--will together contribute only 3% of energy requirements in 1985. Among the undeveloped sources of energy, a likely candidate for early development in large quantities is geothermal energy. An assessment is given of the potential of geothermal energy in meeting the increasing energy demand within the United States during the next few decades and in conserving our fossil fuels. (See also W73-13214) (Knapp-USGS)
W73-13215

WORLDWIDE STATUS OF GEOTHERMAL RESOURCES DEVELOPMENT,
California Div. of Mines and Geology, Sacramento.
J. B. Koenig.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 15-58, 1973. 4 fig, 4 tab.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Stream turbines, Wells.
Identifiers: *Geothermal power, *Power demand.

A conservative projection of worldwide geothermal generating capacity by 1980 is on the order of 2,500 Mw, or three times present day capacity. Because world consumption of electricity during the 8-year period is likely to double, the geothermal power component of world output will remain at less than 1% of total generating capacity. High-enthalpy geothermal systems are known only in regions of youthful volcanism, crustal rifting, and recent mountain building. The major geothermal and volcanic belts are the circum-Pacific margin, island groups of the mid-Atlantic rift, the rift zones of east Africa and the adjacent Middle East, and the irregular belt of mountains and basins extending from the Mediterranean basin of Europe and north Africa across Asia to the Pacific. Lower-enthalpy fluids are far more abundant in volcanic zones and elsewhere, and may represent a greater reserve of useful energy by an order of magnitude or more. Significant areas of lower-enthalpy geothermal fluids include the Gulf Coast of the United States, an extensive region in western Siberia, and portions of central Europe just north of the Alps and the Carpathian Mountains. Geologically, these are subsiding sedimentary basins at the margins of folded mountain ranges. The distribution of geothermal resources on a worldwide scale is summarized, development

and exploration activities are reviewed, and the potential for development over the next decade is evaluated. (See also W73-13214) (Knapp-USGS)
W73-13216

ASSESSMENT OF U.S. GEOTHERMAL RESOURCES,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
R. W. Rex, and D. J. Howell.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 59-67, 1973. 4 tab, 1 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Power demand.

Geothermal energy is not only technically feasible but also practical and economical. Present plants utilize natural underground steam. Hot-water geothermal fields are now under test in the Imperial Valley of California and will be on line in a similar geological setting in northwestern Mexico in 1973. Thus, in the United States geothermal energy can be considered a competitively proved energy source. The western third of the United States, including Alaska and Hawaii, is the most richly endowed in accessible geothermal energy resources. Volcanic energy alone constitutes a reserve of energy which is probably adequate to meet U.S. electrical energy needs for several centuries. Geothermal energy should be capable of supplying a major portion of future U.S. electric-energy requirements. Its development would involve costs lower than those for competing energy systems. Several computer models were utilized to determine how sensitive the profitability and, therefore, the economic feasibility of developing the geothermal resource would be to variations in each cost element. Approximately 1,200 test cases were run for this analysis. The analysis covered the three types of geothermal reservoirs: vapor dominated, hot water, and hot, dry rock systems. (See also W73-13214) (Knapp-USGS)
W73-13217

CHARACTERISTICS OF GEOTHERMAL RESOURCES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 03E.
W73-13218

EXPLORATIONS FOR GEOTHERMAL RESOURCES,
California Univ., Riverside. Dept. of Geological Sciences; and California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 03E.
W73-13219

STEAM PRODUCTION AT THE GEYSERS GEOTHERMAL FIELD,
Union Oil Co. of California, Cloverdale. Big Geysers Station.
For primary bibliographic entry see Field 03E.
W73-13220

DESIGN AND OPERATION OF THE GEYSERS POWER PLANT,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 08C.
W73-13221

THE VAPOR-TURBINE CYCLE FOR GEOTHERMAL POWER GENERATION,
For primary bibliographic entry see Field 08C.
W73-13222

WATER FROM GEOTHERMAL RESOURCES,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 03A.
W73-13223

ENVIRONMENTAL IMPACT OF GEOTHERMAL DEVELOPMENT,
Oregon State Dept. of Geology and Mineral Industries, Portland.
For primary bibliographic entry see Field 06G.
W73-13224

STIMULATION OF GEOTHERMAL SYSTEMS,
Division of Applied Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 08C.
W73-13225

RECOVERY OF GEOTHERMAL ENERGY FROM HOT, DRY ROCK WITH NUCLEAR EXPLOSIVES,
Battelle-Northwest, Richland, Wash. Geothermal Programs.
For primary bibliographic entry see Field 08H.
W73-13226

EXPLOSIVE STIMULATION OF HYDROTHERMAL RESERVOIRS,
Stanford Univ., Calif. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 08H.
W73-13227

INDUCTION AND GROWTH OF FRACTURES IN HOT ROCK,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 08H.
W73-13228

CHEMICAL EXPLOSIVE STIMULATION OF GEOTHERMAL WELLS,
Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 08H.
W73-13229

ENVIRONMENTAL ASPECTS OF NUCLEAR STIMULATION,
Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08H.
W73-13230

CORROSION AND SCALING IN NUCLEAR--STIMULATED GEOTHERMAL POWER PLANTS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 08H.
W73-13231

GEOTHERMAL RESOURCES RESEARCH,
National Science Foundation, Washington, D.C. Div. of Advanced Technology Applications.
J. C. Denton, and D. D. Dunlop.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 335-346, 1973. 4 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Power demand

The objectives of geothermal resource exploration are to locate areas underlain by hot rock, to estimate their volume, temperature, and permeability; and to determine the nature of any producible fluids. Theoretically, this energy source can be tapped from any point on earth simply by drilling sufficiently deep holes, providing passage for some heat-transfer fluid, and extracting the heat. Practically speaking, this hot mass is much too deep to tap in many large areas of the world. Occasionally the source is so close as to be manifested by such surface phenomena as geysers and hot springs. Reservoir engineering involves assessment of the size and deliverability of the geothermal resource and planning for optimum development. Well-stimulation technology is concerned with improving the permeability of the formation, which is important in both production and reinjection. Hydrofracturing, acid treatments, thermal fracturing, and chemical- and nuclear-explosion fracturing should all be considered. Potential environmental effects that need to be examined are gaseous and particulate emissions, land modification, subsidence, seismic hazards, surface-water and groundwater pollution, biological effects, noise effects, and social effects. A research program should emphasize the development of (1) vapor-turbine power-generating systems, (2) improved exploration methods, (3) desalination methods for geothermal fluids, (4) cheaper methods for deep drilling into hot formations, and (5) better models of geothermal reservoirs. (See also W73-13214) (Knapp-USGS)
W73-13232

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX K--RECREATION.
Bureau of Outdoor Recreation, Ann Arbor, Mich. Lake Central Region Office.
For primary bibliographic entry see Field 06B.
W73-13491

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX P--ECONOMIC BASE STUDY AND PROJECTIONS.
For primary bibliographic entry see Field 06B.
W73-13496

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX Q--FRAMEWORK FOR DEVELOPMENT.
For primary bibliographic entry see Field 06B.
W73-13497

6E. Water Law and Institutions

ATTITUDES OF RIPARIANS TOWARDS THEIR LAKE ENVIRONMENTS: A STUDY OF LAKE WYOLA AND DAMON POND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 06A.
W73-13007

ATTITUDES, VALUES, AND PERCEPTIONS IN WATER RESOURCE DECISION-MAKING WITHIN A METROPOLITAN AREA,
Massachusetts Univ., Boston. Dept. of Political Science.
For primary bibliographic entry see Field 06B.
W73-13008

ENVIRONMENTAL PROTECTION THROUGH PUBLIC AND PRIVATE DEVELOPMENT CONTROLS,
Pennsylvania Univ., Philadelphia. Inst. for Environmental Studies.
For primary bibliographic entry see Field 05G.
W73-13025

DECADE OF JUDICIAL DEVELOPMENTS ND CHANGES IN COLORADO WATER LAW: 60-1970,
olorado State Univ., Fort Collins. Dept. of onomics.
M. Ashton, and G. E. Radosevich.
port NRE-13, June 1972. 26 p, 15 ref. OWRR-13-COLO (3).

scriptors: *Colorado, *Water law, *Judicial cisions, *Legal aspects, Water rights, Administrative decisions, Law enforcement, Water ources development, Water policy, Legal iew, Diversion, Diversion structures, Reasonable use, Water management (Applied), Water nts, State jurisdiction, State governments, gulation.

ne of the major decisions pertaining to olorado water law are reviewed with emphasis those significant cases illustrating divergence m earlier precendents. Treatment of statutory where relevant is included. The prime objective is not to provide a general synopsis of current olorado water law, but rather to bring the reader to date on recent significant developments. ch topic presented includes a separate discussion and conclusion. Changes in well and groundter administration and developments are not included. The topics discussed include: transmountain diversion, abandonment, changes in the rse of a river, changes in the point of diversion, necessity of a diversion, and proof of title to ter rights. Those topics of long-term interest ich have not undergone any significant modifiion during the decade are omitted. (Mocklerrida)
3-13070

RATEGIC UNCERTAINTY AND THE NAONAL ENVIRONMENTAL POLICY ACT,
vironmental Defense Fund, East Setauket, Y.
primary bibliographic entry see Field 06B.
3-13148

LLUTION ABATEMENT PROGRAMS IN E DELAWARE RIVER ESTUARY,
laware River Basin Commission, Trenton, N.J.
primary bibliographic entry see Field 05G.
3-13164

OCEEDINGS OF CONFERENCE ON WARD A WATER RESOURCES RESEARCH AN FOR MINNESOTA.
nnesota Univ., St. Paul. Water Resources search Center.

neographed Report. May 1973. 50 p. OWRR A-MINN (28). 14-31-0001-3823.

scriptors: *Water resources institute, Administion, *Minnesota, *Planning, *Research priori, *Comprehensive planning, *Conferences, search and development, Organizations.
ntifiers: Water resources problem-research alyses, Research community.

e Minnesota Water Resources Research Center leveloping a long-range comprehensive plan for ter resources research in Minnesota involving deral, State and local agencies, private oranizations, University of Minnesota, State and vate Colleges, and others. An attempt is being de to formulate broad research guidelines and ograms for coordinating research efforts. During cal year 1974, the Center will place a heavy phasis on the analysis of important water oblems in Minnesota to determine defensible asiated research requirements, i.e., the research cessary to give a reasonable level of assurance the problems can be resolved in a cost-effece and timely fashion. A water resources oblem-research analysis workshop conference ogram will be developed. The objective of this Conference was to discuss matters associated with developing the water resources research plan, and to devise ways and means for completing the plan. The following subjects were discussed: water resources research community in Minnesota, water resources problems in Minnesota and associated research needs, and Federal Water Pollution Control Act amendments and associated research opportunities. (Walton-Minnesota)
W73-13303

ENVIRONMENTAL LEGISLATION: HOW IT AFFECTS FOSSIL-FUEL-FIRED POWER--GENERATING EQUIPMENT,
General Electric Co., Schenectady, N.Y.
N. R. Dibelius, and W. F. Marx.
Mechanical Engineering, Vol 95, No 3, p 76-80, March 1973. 3 tab.

Descriptors: *Environmental control, *Regulation, *Administrative agencies, *Standards, *Electric powerplants, Environmental engineering, Air pollution, Water pollution, Sound waves, Social aspects, Electric power production, Fossil fuels, Coals, Oil, Natural gas, Legal aspects, Federal government, State governments, Legislation, Water quality control.

A summary is presented of federal developments concerning air, water and noise pollution through November 1972. The Clean Air Act set up air-quality-control regions for the achievement of national ambient air standards. Many federally approved state regulation plans contain emission limitations applicable to all steam generators of more than 250 million Btu per hour heat input while some cover units as small as 1 million Btu per hour heat input and others cover gas turbines. These restrictions may affect the placement of power plants. Standards for particulate matter, sulfur dioxide, and nitrogen oxides emissions for gas-, oil-, and coal-fired power plants are presented. The recently enacted Water Pollution Control Act requires that power plants achieve, where possible, no discharge of pollutants. This affects the discharge of cooling water, boiler blowdown, and the use of certain cleaning techniques. Regulations under the Walsh-Healy Act and the Occupational Safety and Health Act govern the level of noise to which employees may be exposed over a period of time. A table indicates these levels. While each of these laws and regulations is important, they must be viewed as a whole to evaluate their effect on a given facility. (Jerome - Vanderbilt)
W73-13474

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX L--FISH AND WILDLIFE RESOURCES.
Bureau of Sport Fisheries and Wildlife, Minneapolis, Minn.
For primary bibliographic entry see Field 06B.
W73-13492

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX O--STATE AND FEDERAL WATER LAWS, POLICIES, AND PROGRAMS.
Corps of Engineers, Chicago, Ill. North Central Div.
For primary bibliographic entry see Field 06B.
W73-13495

GROUNDWATER: FROM WINDMILLS TO COMPREHENSIVE PUBLIC MANAGEMENT,
Nebraska Univ., Lincoln. School of Law.
R. S. Harnsberger, J. C. Oeltjen, and R. J. Fischer.
Nebraska Law Review, Vol 52, No 2, p 179-292, 1973. OWRR B-007-NEB (3), 14-31-0001-3301.

Descriptors: *Groundwater, *Water management (Applied), *Planning, *Nebraska, Withdrawal, Legal aspects, Riparian rights, *Irrigation.

This article is the second of three analyzing legal aspects of water resources planning in Nebraska. (See W73-00475 and W73-13506). This article describes groundwater utilization in Nebraska and analyzes some of its major problems. Despite increasing conflict between users, subterranean withdrawals have never been managed other than by the individual decisions of thousands of farm irrigators and domestic, industrial and municipal users. This contrasts sharply with the comprehensive scheme regulating stream diversions since 1895 which will be the focus of the last study in this series.
W73-13505

RIGHTS TO NEBRASKA STREAMFLOWS: AN HISTORICAL OVERVIEW WITH RECOMMENDATIONS,
Nebraska Natural Resources Commission, Lincoln.
R. J. Fischer, R. S. Harnsberger, and J. C. Oeltjen.
Nebraska Law Review, Volume 52, No 3, p 313-376, 1973. OWRR B-007-NEB (4), 14-31-0001-3301.

Descriptors: *Water management (Applied), Planning, *Riparian rights, Appropriation, Streamflow, Legal aspects, *Nebraska, *Prior appropriation, *Irrigation.

This article is the third of three analyzing legal aspects of water resources planning in Nebraska. (See W73-00475 and W73-13504). The chief purposes are to: (1) describe the present system of riparianism in Nebraska and show how it creates uncertainty and confusion; (2) recount the philosophy of the early settlers leading to passage of the Irrigation and Appropriation Act of 1895, which remains the basic law governing water rights in natural watercourses; (3) depict the 1895 Act; and (4) propose several major modifications.
W73-13506

THE PRESIDENT'S 1973 ENVIRONMENTAL PROGRAM.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06G.
W73-13528

GROUND-WATER CONTAMINATION AND LEGAL CONTROLS IN MICHIGAN,
For primary bibliographic entry see Field 05B.
W73-13562

AN ACT PROHIBITING THE POLLUTION DISCOLORATION, CONTAMINATION, CLOGGING, OR DIVERSION OF PUBLIC STREAMS.

Act No. 1199, Acts of Alabama, p 2078-2079, 1971.

Descriptors: *Alabama, *Legislation, *Water pollution sources, *Streams, *Water pollution control, Pollutants, Sewage treatment, Water quality, Water treatment, Wastes, Water conservation, Local governments, Penalties (Legal), Water quality control, Administrative agencies, Administrative decisions, Regulation, Permits.

In all counties having a population between 175,000 and 300,000, it shall be unlawful for any person, firm, corporation or association to discharge, dispose or negligently to allow the deposit in the public streams of any wastes composed of raw sewage, industrial wastes or other wastes in such manner as to pollute, discolor, contaminate, clog, or divert the public streams, unless the waste is first treated or processed in accordance with standards promulgated by the Alabama Water Improvement Commission. Penalties for violation of this act are included, and each day a violation continues it shall constitute a separate act. (Mockler-Florida)
W73-13650

6F. Nonstructural Alternatives

ATTITUDES OF RIPARIANS TOWARDS THEIR LAKE ENVIRONMENTS: A STUDY OF LAKE WYOLA AND DAMON POND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 06A.
W73-13007

ENVIRONMENTAL PROTECTION THROUGH PUBLIC AND PRIVATE DEVELOPMENT CONTROLS,
Pennsylvania Univ., Philadelphia. Inst. for Environmental Studies.
For primary bibliographic entry see Field 05G.
W73-13025

6G. Ecologic Impact of Water Development

CHANGING TIMES FOR WATER RESEARCH AND TECHNOLOGY TRANSFER,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W73-13038

WATER POLLUTION: ENVIRONMENTAL IMPACTS AND MEANS OF CONTROL,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W73-13078

REACTIONS OF CANADA GEESE TO RESERVOIR IMPOUNDMENT ON THE SNAKE RIVER IN WASHINGTON,
Washington State Univ., Pullman. Dept. of Zoology.
L. W. Gibson, and I. O. Buss.
Northwest Science Vol 46, No 4, p 301-318, 1972. 5 fig, 3 tab, 30 ref. OWRR-A-054-WASH (1).

Descriptors: Ecology, Dams, *Geese (Wild), Ducks, *Waterfowl, Management, *Washington, *Canada goose, *Impoundments, Reservoirs.
Identifiers: *Snake River (Wash).

A difficult aspect of river-development evaluation is the effect of dams upon wildlife. Currently a vast network of moderately sized dams is being constructed in the Pacific Northwest. Many of these dams, such as those completed and being completed on the Snake River in southwest Washington, create profound changes in the ecology of the entire region. Unfortunately, the need for pre- and post-impoundment research on such areas is usually realized too late. Vast changes in ecosystems occur without meaningful studies being conducted. This report is the latest of a continuous series of waterfowl studies, primarily concerning the great basin Canada goose Branta canadensis moffitti, conducted prior to, during, and after completion of a series of dams on the Snake River. The three objectives of this study are: (1) to evaluate ecological changes and their effects on Canada goose nesting on the Snake River between Almota and Central Ferry, Washington, as dam construction inundated important breeding sites, (2) to study various aspects of goose behavior based partly on marked geese, and (3) to study the use of artificial nesting structures under pre- and post-impoundment conditions.
W73-13082

ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MNAGEMENT,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 02L.
W73-13210

ENVIRONMENTAL IMPACT OF GEOTHERMAL DEVELOPMENT,
Oregon State Dept. of Geology and Mineral Industries, Portland.
R. G. Bowen.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 197-215, 1973. 3 fig, 22 ref.

Descriptors: *Environmental effects, *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells, Thermal pollution, Water pollution sources.
Identifiers: *Geothermal power.

The geothermal plant is unique in that all of the steps in the fuel cycle are localized at the site of the power production facilities. In all other methods of power production, the environmental impact of the fuel cycle extends far beyond the bounds of the power generating plant. The chief impact from the use of geothermal power occurs during the period of development of the field and construction of the steam gathering lines and powerplants, but the impact is limited to the area of the field and poses nothing like the vast disruption of the landscape caused by mining the fuels for other thermal powerplants. During the productive lifetime of the geothermal field, which can extend over many decades, most of the source area can be used for other purposes. At Larderello, for example, where natural steam has been used to produce electricity for 60 years, farms, orchards, and vineyards cover much of the land surface. Natural steam does contain a small percentage of noncondensable gases that are vented to the air. But compared to the amounts dissipated by fossil fuel plants, these gases--mostly carbon dioxide but also nitrogen, hydrogen, methane, and hydrogen sulfide--are minor. Compared to the total gaseous release from all steps in the nuclear fuel cycle, the overall volume and toxicity of gases from the geothermal plant is, again, minor. (See also W73-13214) (Knapp-USGS)
W73-13224

ENVIRONMENTAL ASPECTS OF NUCLEAR STIMULATION,
Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08H.
W73-13230

CORROSION AND SCALING IN NUCLEAR--STIMULATED GEOTHERMAL POWER PLANTS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 08H.
W73-13231

ECOLOGICAL EFFECTS OF OFFSHORE DREDGING AND BEACH NOURISHMENT: A REVIEW,
University of Southern Mississippi, Hattiesburg.
For primary bibliographic entry see Field 05C.
W73-13290

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SURRY POWER STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C
W73-13408

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE ST. LUCIE PLANT UNIT NO. 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13410

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE CONTINUATION OF CONSTRUCTION OF UNIT 2 AND THE OPERATION OF UNITS 1 AND 2 MILLSTONE NUCLEAR POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13411

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE CONSTRUCTION OF SUSQUEHANNA STEAM ELECTRIC STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13412

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF NINE MILE POINT NUCLEAR STATION UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-13413

ENERGY IMPLICATIONS OF SEVERAL ENVIRONMENTAL QUALITY STRATEGIES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05G.
W73-13421

RESEARCH NEEDS ON WASTE HEAT TRANSFER FROM LARGE SOURCES INTO THE ENVIRONMENT.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05G.
W73-13473

ENVIRONMENTAL LEGISLATION: HOW IT AFFECTS FOSSIL-FUEL-FIRED POWER--GENERATING EQUIPMENT,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 06E.
W73-13474

MAINTENANCE OF GREAT SOUTH BAY AND PATCHOGUE RIVER, NEW YORK, NAVIGATION PROJECT (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08B.
W73-13524

THE PRESIDENT'S 1973 ENVIRONMENTAL PROGRAM.
Council on Environmental Quality, Washington, D.C.

Available from GPO, Washington, D.C. 20402 Price $5.05. April 1973. 585p.

Descriptors: *Comprehensive planning, *Land use, *Environment, Water pollution control, Farms, Air pollution, Legislation, Land resources, Water resources, Land development, Land management, Natural resources, Parks, Ecology, United States.
Identifiers: *Environmental Program (1973).

A National Land Use Policy Act would authorize Federal assistance to encourage the States, in cooperation with local governments, to protect lands which are of critical environmental concern and to control major development, including airport and highway siting. Any state that fails to establish an acceptable land use program within three years from enactment would be subject to cumulative reductions of up to 21% of the funds allocated to the State under the Airport and Airway Development Act, the Federal-aid Highway Acts, including the Highway Trust Fund, and the Land and Water Conservation Fund. The major categories of the program are managing the Land, expanding farm production, controlling pollution, and protecting our natural heritage. (Knapp-USGS)
W73-13528

PROPOSED CENTRAL ARIZONA PROJECT (FINAL ENVIRONMENTAL STATEMENT). AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS EIS-AZ-72-5-357-F1. BUREAU OF RECLAMATION, BOULDER CITY, NEVADA. (FES 72-35) SEPTEM BER 1972, 597 P. MAPS. 203 REF.
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 04A.
W73-13552

A CHEMICAL APPROACH TO THE PROBLEM OF ENVIRONMENTAL CONTAMINATION,
P. Jotuni.
Suom Kemistil A. Vol 45, No 1, p 1-6. 1972. Illus.
Identifiers: *Chemical studies, Contamination, Environmental effects, *Ecology.

A method for determining the elemental content in various envioronments and, at the same time, the situation before human activities started changing it is presented. Emphasis is on man's own elemental composition; also included are the composition of wood and water. The limiting factor is how the ancient material is found and dated.--Copyright 1973, Biological Abstracts, Inc.
W73-13586

07. RESOURCES DATA

7A. Network Design

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. Dyhr-Nielson.
Doctoral dissertation, May 1972. 134 p, 26 fig, 11 tab, 56 ref, append. OWRR-A-009-COLO (1).

Descriptors: *Hydrology, *Data collections, *Evaluation, *Stochastic processs, *Estimating, Analytical techniques, Water resources development, Management, Mathematical models, Systems analysis.
Identifiers: *Information loss, *Discretization procedures, *Sampled data.

This study considers the use of discretized data as the basis for stochastic modeling of continuous hydrologic variables and processes. A procedure is presented for quantitative evaluation of the loss of information when parameters of continuous stochastic processes are estimated on the basis of discrete sampled data. Three discretization procedures are considered: (1) Discrete point sampling, where the process is sampled at periodic time intervals as a series of instantaneous values; (2) average sampling, where the process is sampled as a series of average values; and (3) quantization of the variable, where its values are pooled into class intervals. The decision theoretical concept of 'expected information loss,' based on a linear loss function, is used as the measure of information content. For each discretization procedure, general expressions for the expected information loss in estimating mean, variance and autocovariance are found as functions of the discretization interval, the length of the sampling period, and the mean, variance, and autocovariance of the continuous process. A streamflow series is analyzed to show the applicability and potential of the approach. Average sampling introduces significant losses of information due to the biasing effect inherent in the sampling procedure. With the exception of the mean, a sample of instantaneous values contains more information about the parameters investigated than a sample of average values, taken over the same sampling interval. (Bell-Cornell)
W73-13075

NATURAL REGIME HYDROLOGICAL NETWORK PLANNING, A METHODOLOGICAL DISCUSSION,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 06A.
W73-13136

ERRORS OF MEASUREMENT, PRECISION, ACCURACY AND THE STATISTICAL COMPARISON OF MEASURING INSTRUMENTS,
Army Ballistic Research Labs., Aberdeen Proving Ground, Md.
F. E. Grubbs.
Technometrics, Vol 15, No 1, p 53-66, February 1973. 2 tab, 8 ref.

Descriptors: *Instrumentation, *Measurement, *Statistical methods, Laboratory equipment, Research equipment, Methodology.
Identifiers: *Accuracy, *Precision, *Errors.

A very important and yet widely misunderstood concept or problem in science and technology is that of precision and accuracy of measurement. It is therefore necessary to define the terms precision and accuracy (or imprecision and inaccuracy) clearly and analytically if possible. Also, we need to establish and develop appropriate statistical tests of significance for these measures, since generally a relatively small number of measurements will be made or taken in most investigations. A discussion is given of some of the pertinent literature for estimating variances in errors of measurement, or the 'imprecisions' of measurement, when two or three instruments are used to take the same observations on a series of items or characteristics. Also, present techniques for comparing the imprecision of measurement of one instrument with that of a second instrument through the use of statistical tests of significance are reviewed, as well as procedures for detecting the significance of the difference in biases or levels of measurement of two instruments. Finally, methods are indicated of extending present theory to the case of three measuring instruments, for which rather sensitive statistical tests of significance are developed for dealing with the precision and accuracy problem. An example for the three instrument case is given to illustrate the suggested methodology of analysis. (Mortland-Battelle)
W73-13194

NETWORK DENSITY OF TEMPERATURE PROFILE STATIONS AND ITS INFLUENCE ON THE ACCURACY OF LAKE EVAPORATION CALCULATIONS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02D.
W73-13365

7B. Data Acquisition

MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU THERMAL PROBE,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02F.
W73-13013

DATA ACQUISITION SYSTEMS IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-13024

REGIME, THEORY, AND METHODS OF CALCULATION AND MEASUREMENT OF SEDIMENTS AND WASTE WATERS (REZHIM, TEORIYA, METODY RASCHETA I IZMERENIYA NANOSOV I STOCHNYKH VOD).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-13045

STUDY OF SUSPENDED SEDIMENTS IN RESERVOIRS BY THE METHOD OF SPECTRAL DIFFUSIVITY (IZUCHENIYE VZVESHENNYKH NANOSOV V VODOKHRANILISHCHAKH METODOM SPEKTRAL'NOY YARKOSTI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-13052

AN IMPROVED QUICK-FIELD METHOD OF CALCULATING WASTE WATER DILUTION IN RIVERS (USOVERSHENSTVOVANIYE EKSPRESS-METODA RASCHETA RAZBAVLENIYA STOCHNYKH VOD V REKAKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W73-13054

TRANSIENT VIBRATION TECHNIQUES TO DETERMINE WAVE VELOCITIES IN-SITU,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W73-13055

DETERMINATION OF LOW PHOSPHATE CONCENTRATIONS IN SEAWATER BY AN ISOBUTYL ACETATE EXTRACTION PROCEDURE,
Osservatorio Geofisico Sperimentale, Trieste (Italy).
For primary bibliographic entry see Field 05A.
W73-13057

A NEW METHOD FOR DETERMINING THE TOTAL CARBONATE ION CONCENTRATION IN SALINE WATERS,
Lamont-Doherty Geological Observation, Palisades, N.Y.
For primary bibliographic entry see Field 02K.
W73-13063

THE POLAROGRAPHIC DETERMINATION OF TRACE AMOUNTS OF CYANIDE,
Salford Univ. (England). Dept. of Chemistry and Applied Chemistry.
For primary bibliographic entry see Field 05A.
W73-13067

WATER LOSS FROM CUT GRASS WITH SPECIAL REFERENCE TO HAY-MAKING,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 03F.
W73-13119

DEVELOPMENTS IN APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC MODELING,
IBM Space Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 02E.
W73-13146

POLARIZATION: A KEY TO AN AIRBORNE OPTICAL SYSTEM FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 05A.
W73-13167

THE CALIBRATION AND RESPONSE OF ION--SELECTIVE ELECTRODES AT LOW CONCENTRATIONS OF PRIMARY IONS,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
For primary bibliographic entry see Field 02K.
W73-13188

RECENT RESULTS ON THE DYNAMIC RESPONSE OF PRECIPITATE-BASED ION--SELECTIVE ELECTRODES,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
For primary bibliographic entry see Field 02K.
W73-13189

A RUGGED SILVER-SILVER CHLORIDE ELECTRODE FOR FIELD USE,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
R. F. Corwin, and U. Conti.
The Review of Scientific Instruments, Vol 44, No 6, p 708-711, June 1973. 7 fig, 14 ref.

Descriptors: *On-site data collections, Electrochemistry, Resisitivity, Salinity, Reliability, Temperature, Design.
Identifiers: *On-board analysis, *Marine environment, *Silver/silver chloride electrode, *Electrochemical behavior, Ion selective electrodes, Shipboard measurements, Mechanical shock.

A rugged silver-silver chloride electrode has been developed and used successfully in a variety of field applications. The electrode housing is made of 2.54 cm o.d. clear acrylic plastic rod. The filling solution is 2.7 M potassium chloride saturated with silver chloride, and contact with the external medium is made through a porous ceramic rod. Results of laboratory and field tests measuring the response of the electrode to chemical, thermal, mechanical, and electrical disturbances are presented. The electrode has provided relaible service when subjected to severe mechanical abuse during both offshore and onshore use. (Holoman-Battelle)
W73-13193

ATOMIC ABSORPTION INHIBITION TITRATION OF ORTHOPHOSPHATE AND POLYPHOSPHATES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 05A
W73-13198

ISOTOPHIC TRACER TECHNIQUES FOR IDENTIFICATION OF SOURCES OF NITRATE POLLUTION,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
For primary bibliographic entry see Field 05B.
W73-13201

ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MNAGEMENT,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 02L.
W73-13210

DETECTION OF FRESH WATER AQUIFERS IN THE GLACIAL DEPOSITS OF NORTHWESTERN MISSOURI BY GEOELECTRICAL METHODS,
Missouri Univ., Rolla. Geophysical Observatory.
For primary bibliographic entry see Field 04B.
W73-13213

APPARATUS FOR SEMI-CONTINUOUS CULTURE OF DAPHNIA,
For primary bibliographic entry see Field 05A.
W73-13239

ATOMIC FLUORESCENCE SPECTROMETRY WITH A GRAPHITE ROD ATOMIZER AND THERMOSTATED ELECTRODELESS DISCHARGE LAMPS,
Florida Univ., Gainesville. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-13260

ENZYME ELECTRODES,
Utah Univ., Salt Lake City. Coll. of Engineering.
For primary bibliographic entry see Field 05A.
W73-13266

COLLABORATIVE STUDY OF THE NONAQUEOUS COPPER COLORIMETRIC AND SILVER TITRIMETRIC METHODS FOR THE DETERMINATION OF MALATHION IN TECHNICAL GRADE MALATHION AND IN MALATHION FORMULATION,
American Cyanamid Co., Princeton, N.J.
For primary bibliographic entry see Field 05A.
W73-13283

CHEMICAL COMPOSITION OF OCEAN USING A DIRECT MEASURING OCEANOGRAPHIC ELECTROCHEMICAL PROBE,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 02K.
W73-13294

IMPROVED WATER ANALYSIS KIT,
Franklin Inst. Research Labs., Philadelphia, Pa.
W. H. Collins.
Available from the National Technical Information Service as AD-756 952, $3.00 in paper copy, $1.45 microfiche. Report Nos LWL-CR-03B69, FIRL-F3222-02/03, December 1972. 20 p, 12 fig, append. Contract No DAAD05-72-C-0113.

Descriptors: *Water analysis, *Water quality, *Equipment, *On-site tests, *Testing procedures, *Instrumentation, *Water properties, On-site investigations, Physical properties, Chemical properties, On-site data collections, Chemical analysis, Hardness (Water), Alkalinity, Chlorides, Sulfates, Hydrogen ion concentration, Acidity, Flocculation, Turbidity, Methodology, Coagulation, Pollutant identification.
Identifiers: Chlorine residual, Chlorine demand.

An improved water test kit which is smaller in size and simpler to use and stock than Water Quality Control Set, FSN 6630 262 7288, Standard B has been developed for the Army Land Warfare Laboratory. The kit has a minimum of glassware, weights 4 1/2 pounds, measures 9 X 6 X 6 inches and used techniques completely different than former methods. Eliminated is the need of preparing reagents, performing titrations and other tedious measurements. Most of the tests are conducted by dipping a paper or plastic strip into the water sample and reading the height of a column or comparing the color obtained to a chart. No complicated calculations are required. Water samples can be examined for pH, acidity, alkalinity, chlorine residual, chlorine demand, chloride, sulfate, turbidity and coagulation characteristics. Each kit contains enough material to examine at least 50 water samples for each of the above characteristics before requiring refill. The simplicity of the kit allows personnel with little or no training to use it effectively. (Holoman-Battelle)
W73-13297

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS.
Wisconsin Univ., Madison. Inst. of Environmental Studies.
For primary bibliographic entry see Field 05A.
W73-13299

RADAR SOUNDING OF THE ABRAMOV GLACIER (RADIOLOKATSIONNOYE ZONDIROVANIYE LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W73-13356

ON THE ANALYSIS OF 'SLUG TEST' DATA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-13369

MONITORING SNOW WATER EQUIVALENT BY USING NATURAL SOIL RADIOACTIVITY,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 02C.
W73-13382

NAVIFACIAL TEMPERATURE AND SALINITY ALONG THE TRACK FROM SAMOA TO HAWAII, 1957-1965,
Stevens Inst. of Technology, Hoboken, N.J.
For primary bibliographic entry see Field 02E.
W73-13435

MEASURING THERMAL PLUMES IN THREE DIMENSIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05B.
W73-13450

SPECTRA OF THE TEMPERATURE AND HUMIDITY FLUCTUATIONS IN THE MARINE BOUNDARY LAYER,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia).

Warner.
arterly Journal of the Royal Meteorological ciety, Vol 99, No 419, p 82-88, January 1973. 4 2 tab, 12 ref.

scriptors: *Atmospheric physics, *Boundary ers, *Convection, *Air temperature, *Air circuon, Meteorology, Maritime air masses, Wind ocity, Measurements, Evaluation, Aircraft, -water interfaces, Oceans, Mixing, Humidity.

sults are discussed of measurements of temature and humidity made from an aircraft in 61 s at heights of 30 to 550 meters over the open in conditions of active convection with mean d speeds between 4.5 and 9.5 M/S. The intensif the fluctuations of temperature and humidity lifferent conditions is examined and compared ther data. The scaled values of the fluctuations temperature and mixing ratio are consistent n the law appropriate to free convection for ed heights up to 2; at higher levels there is less dence for a change with height. While the vir- potential temperature fluctuations in terms of rdorff's temperature scale decreased ewhat with scaled height in terms of depth of convection layer, their magnitude at all heights uch greater than predicted. It is possible that mixing at the upper boundary is important in ermining the magnitude of the fluctuations in ual potential temperature right down to the sure. The spectra obeyed the -5/3 power law for ensionless frequencies in excess of about 0.3. ome-Vanderbilt)
3-13455

TOMATED WATER MONITORING INSTRUNT FOR PHOSPHORUS CONTENTS,
clear Corp. of America, Denville, N.J. Nuclear
primary bibliographic entry see Field 05A.
3-13470

PROVED MERCURY WELL FOR MULTIE TENSIOMETER SYSTEMS,
icultural Research Service, Mandan, N. Dak. and Water Conservation Research Div.
. Doering, and J. P. Harms.
Sci Soc Am Proc. Vol 36 No 5, p. 849-850. 2, Illus.
ntifiers: *Manometer, *Mercurywell, isture, Soils, *Tensiometers.

ails are presented for the fabrication of an imved mercury well for multiple tensiometer tems. The well is mounted on the back of the nometer support and is so designed that indual manometers can be reparied without urbing the other manometers. Scale zero is ble and low moisture tensions can be read.--yright 1973, Biological Abstracts, Inc.
3-13523

EDIMENT SQUEEZER FOR REMOVAL OF RE WATERS WITHOUT AIR CONTACT,
ifornia Univ., Los Angeles. Dept. of Geology.
primary bibliographic entry see Field 02J.
3-13531

VIBRATORY CORING SYSTEM FOR CONENTAL MARGIN SEDIMENTS,
de Island Univ. Kingston. Graduate School of anography.
primary bibliographic entry see Field 02J.
3-13532

ELUTRIATOR METHOD FOR PARTICLEZE ANALYSIS WITH QUANTITATIVE SILT ACTIONATION,
ois State Geological Survey, Urbana.
primary bibliographic entry see Field 02J.
3-13533

A SPLITTER FOR UNCONSOLIDATED CORES TAKEN IN PLASTIC LINERS,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 02J.
W73-13535

SIEVE LOAD EQUATIONS AND ESTIMATES OF SAMPLE SIZE,
California State Univ., Sacramento. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-13536

USE OF A NEUTRON MOISTURE PROBE TO DETERMINE THE STORAGE COEFFICIENT OF AN UNCONFINED AQUIFER,
Geological Survey, Garden City, Kans.
For primary bibliographic entry see Field 04B.
W73-13554

A PERISCOPE FOR THE STUDY OF BOREHOLE WALLS, AND ITS USE IN GROUND-WATER STUDIES IN NIAGARA COUNTY, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-13555

A PORTABLE SAMPLER FOR COLLECTING WATER SAMPLES FROM SPECIFIC ZONES IN UNCASED OR SCREENED WELLS,
Geological Survey, Ocala, Fla.
For primary bibliographic entry see Field 04B.
W73-13557

DESCRIPTION AND USE OF AN UNDERWATER TELEVISION SYSTEM ON THE ATLANTIC CONTINENTAL SHELF,
Geological Survey, Washington, D.C.
R. D. Laura, and M. A. Idnani.
Plant Soil. Vol 37, No 2, p 283-295, 1972. Illus.

Descriptors: Logging (Recording), *Underwater, *Continental shelf, *Georgia, Continental slope, Exploration, Geologic investigations, *Photography, Coasts.
Identifiers: Decomposition, Flocculation, *Manures, Microbial studies, *Nitrogen, Peptizing reactions, Phosphates, *Slurry, Urea, *Wheat yield.

The use of liquid spent-slurry gave higher wheat yield and more N uptake than sun-dried slurry. The depressing effect of sun-drying on available N in slurry was attributed to enhanced irreversibility of the flocculative and peptizing reactions of organic colloidal matter due to desiccation and thus increased resistance to subsequent microbial decomposition and mineralization of slurry N. The absorption of liquid slurry in organic absorbents like green leaf powder, dry leaf powder, and sawdust greatly enhanced its manurial value. Its absorption in inorganic absorbents like charcoal dust and ash did not increase wheat yield, but N uptake was somewhat higher than sun-dried slurry. Like ordinary farm compost, the composts prepared by composting liquid slurry with wheat straw and sorghum stover gave lower yield and low N uptake. The enrichment of slurry with urea and superphosphate gave a manure which has a higher manurial value than (NH4)2SO4 on equivalent N basis.--Copyright 1973, Biological Abstracts, Inc.
W73-13559

UNDERGROUND SURVEYS WITH BOREHOLD CAMERAS,
Pennsylvania Drilling Co., Pittsburgh.
For primary bibliographic entry see Field 04B.
W73-13566

WATER: EXAMINATION, ASSESSMENT, CONDITIONING, CHEMISTRY, BACTERIOLOGY. BIOLOGY,
For primary bibliographic entry see Field 05A.
W73-13573

APPARATUS FOR REMOTE CENTRALIZED MEASUREMENT OF SOIL HUMIDITY BY THE ELECTROMETRIC METHOD, (IN ITALIAN),
Turin Univ. (Italy). Istituto di Agronomia Generale e Coltivazioni Erbacee.
For primary bibliographic entry see Field 02G.
W73-13582

A BATTERY DRIVEN MEASURING APPARATUS FOR THE ELECTRICAL REGISTRATION OF EVAPORATION OR DEWFALL, (IN GERMAN),
Innsbruck Univ. (Austria). Institut Allgemeine Botanik.
For primary bibliographic entry see Field 02D.
W73-13619

7C. Evaluation, Processing and Publication

DETERMINATION OF OPTIMAL MULTIPLE USES OF A SMALL WATER RESOURCE,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06A.
W73-13009

HYDRA: DYNAMIC MODEL FOR URBAN HYDROLOGIC SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 04A.
W73-13012

EVALUATION OF TECHNIQUES FOR DETERMINING AVERAGE PRECIPITATION IN SEMIARID VALLEYS OF IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02B.
W73-13028

FINITE ELEMENT SOLUTION TO UNCONFINED GROUNDWATER FLOW WITH INFILTRATION,
Rhode Island Univ., Kingston. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-13031

SOME PROBLEMS IN STOCHASTIC HYDROLOGY,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 02A.
W73-13039

WATER LEVELS AND SPRING DISCHARGES FOR SELECTED WELLS AND SPRINGS IN NEVADA, 1966-69,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-13043

USE OF COMPUTERS TO COMPUTE UNSTEADY WIND CURRENTS IN BODIES OF WATER AS ILLUSTRATED BY LAKE BAYKAL (PRIMENENIYE EVM DLYA RASCHETA NEUSTANOVIVSHIKHSYA VETROVYKH TECHENIY V VODOYEMAKH (NA PRIMERE OZ. BAYKAL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

For primary bibliographic entry see Field 02H.
W73-13053

WATER RESOURCES DATA FOR TEXAS, 1972: PART 1, SURFACE WATER RECORDS.
Geological Survey, Austin, Tex. Water Resources Div.

Basic Data Report, 1973. 625 p. 1 fig, 3 ref.

Descriptors: *Hydrologic data, *Surface waters, *Texas, *Basic data collections, *Streamflow, Gaging stations, Flow rates, Low flow, Peak discharge, Reservoirs, Lakes, Water supply.

Surface-water records for the 1972 water year for Texas, including records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites, are presented. Records for a few pertinent gaging stations in bordering States also are included. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W73-13069

A MINIMUM COST WATER DISTRIBUTION NETWORK,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13071

DESIGN OF OPTIMAL WATER DISTRIBUTION NETWORKS USING DYNAMIC PROGRAMMING,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13072

AN INTERACTIVE DESIGN SYSTEM FOR WATER DISTRIBUTION NETWORKS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13073

COMPUTER PROGRAMS IN HYDROLOGY,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
C. E. Bowers, A. F. Pabst, and S. P. Larson.
Project Report No 124, June, 1971. 182 p, 31 fig, 5 tab, 37 ref. OWRR-A-020-MINN (3).

Descriptors: *Computer programs, *Hydrology, Water resources, *Projects, *Design, *Mathematical models, *Reviews, Hydrographs, Floods, Surface waters, Optimization, Simulation analysis, Streamflow, Routing, Reservoirs, River basins, Lakes, Flood forecasting, Runoff, Dams, Watersheds (Basins), Open channels, Hydraulics, Probability, Distribution, Statistical methods, Model studies, Rainfall-runoff relationships, Systems analysis.
Identifiers: Federal agencies, Source decks, Listings, Loss rate, Root river (Houston), Log-Pearson type method.

Research efforts in hydrology and hydraulic engineering have resulted in the development of many computer programs. Available programs in hydrology were reviewed with the aim of assisting in the application of these programs by potential users. The primary focus is upon programs which will be used for design purposes (as well as research), and programs based on well-known procedures which as a result have immediate application to design problems. Many of these programs are available for use by other agencies, organizations, and individuals. Problems associated with adapting programs to a given computer and with understanding the technical procedure on which the program was based are discussed. Numerous computer programs are described, most of which were run on a CDC 6600 digital computer. General conclusions are given, including suggestions to those who might make use of the types of computer programs included in the study. Finally, an annotated bibliography covering a variety of topics in hydrology for which computer programs are of interest, and a list of computer programs developed by various organizations are presented. (Bell-Cornell)
W73-13076

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II.
For primary bibliographic entry see Field 04A.
W73-13134

PROBLEMS OF ANALYTICAL METHODS IN HYDROLOGIC DATA COLLECTIONS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
I. Rodriguez-Iturbe, E. H. Vanmarcke, and J. C. Schaake.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 451-472, (1972) 1 fig, 2 tab, 12 ref.

Descriptors: Hydrology, *Hydrologic data, *Data collections, *Analytical techniques, Estimation, Correlation analysis, Design, Costs, Optimization, Equations, Networks, Size, Time.
Identifiers: Multidimensional processes, Stationarity, Bayesian methods, Random sampling, Global, Local.

General techniques are discussed for evaluation of the accuracy of hydrologic data collection systems. Presented is a discussion of multidimensional correlation functions from a genetic point of view. Hydrologic data is generally insufficient to discriminate among several correlation functions which supposedly describe the process in space; nevertheless the sampling requirements for a fixed accuracy may significantly vary from one function to the other making advisable a study of the genetic characteristics of these correlation functions. A general framework is presented for the estimation of spatial averages over a certain area. It is shown that the variance of the average depends on the spatial correlation, the geometry and size of the sampling network and the size of the area considered. Quantitative examples are given for estimating the number of stations with different sampling geometries. The time dimension is then introduced into the previous scheme allowing a quantitative evaluation of the old problem of time-vs-space trade in hydrologic networks. The assumption of stationarity is discussed, finally. A much weaker assumption of 'stationary increments' seems sufficient for the spatial process, allowing hydrologists to deal with regions where there exists a linear drift in the mean value of the process. (See also W73-13134) (Bell-Cornell)
W73-13135

AN ANALYSIS OF SAMPLING-FREQUENCY ALTERNATIVES FOR FITTING A DAILY STREAM-TEMPERATURE MODEL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-13142

INFORMATION CONTENT OF THE RE GIONAL MEAN,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13145

THE MARGIN OF SAFETY FOR COMPENSAT ING LOSSES DUE TO UNCERTAINTIES I HYDROLOGICAL STATISTICS,
Research Inst. for Water Resources Development Budapest (Hungary).
For primary bibliographic entry see Field 06B.
W73-13157

UNCERTAINTY IN THE RETURN PERIOD O MAXIMUM EVENTS: A BAYESIAN AP PROACH,
Arizona Univ., Tucson. Dept. of Hydrology an Water Resources.
For primary bibliographic entry see Field 02B.
W73-13158

CONCERNING THE CALCULATION O LEVEL VERIATION OF CUTOFF WATE BALANCE,
Gruzinskii Nauchno-Issledovatelskii Institu Gidrotekhniki i Melioratsii, Tiflis (USSR).
For primary bibliographic entry see Field 04A.
W73-13163

SOME PROBLEMS ASSOCIATED WITH TH ANALYSIS OF MULTIRESPONSE DATA,
Wisconsin Univ., Madison.
G. E. P. Box, W. G. Hunter, J. F. MacGregor, and J. Erjavec.
Technometrics, Vol 15, No 1, p 33-51, Februar 1973. 3 fig, 4 tab, 8 ref.

Descriptors: *Statistical methods, *Chemical ana ysis, Estimating, Kinetics, Mathematical models.
Identifiers: *Data interpretation, Multiespons data, Linear dependencies, Nonlinear model Multivariate analysis, Errors.

Unless special care is exercised in analyzing mul tiresponse data serious mistakes can be made Some problems associated with fitting mul tiresponse models are identified and discussed. I particular, three kinds of dependencies are con sidered: dependence among the errors, linear de pendencies among the expected values of th responses, and linear dependencies in the data Since ignoring such dependencies can lead to dif ficulties, a method is described for detecting an handling them. The concepts involved are illus trated with a chemical example. (Mortland-Ba telle)
W73-13195

QUALITY OF SURFACE WATERS OF TH UNITED STATES, 1968: PART II. PACIFI SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-13200

DECISION MAKING IN WATER RESOURC ALLOCATION,
Oregon State Univ., Corvallis. Dept. o Anthropology.
For primary bibliographic entry see Field 06B.
W73-13301

REAMFLOW DATA USAGE IN WYOMING,
oming Univ., Laramie. Water Resources
earch Inst.
E. Smith.
ter Resources Series No. 33, February 1973. 12
tab, 17 ref. OWRR A-001-WYO (65).

criptors: Data systems, Hydrology, Networks,
off, Stream gage, *Wyoming, *Streamflow,
drologic data.

le several kinds of hydrologic studies are com-
ly made, high-flow studies are the most nu-
ous. A survey of organizations making
rologic studies in Wyoming shows that most
nizations make high-flow studies, while low-
and water availability studies are made by
one-half of those organizations. Several
els of runoff are in existence, with most of
n being developed. Numerous methods of esti-
ng streamflow are used, which points to the
for more streamflow observations; but
nomic limitations on data collection require
estimations continue to be made.
-13306

CRIPTION OF GLACIER RECESSION IN
AMU-DAR'YA RIVER BASIN FROM
IAL PHOTOGRAPHIC SURVEY DATA
1946-66 (KHARAKTERISTIKA OTSTU-
IYA LEDNIKOV BASSEYNA R. AMUDAR'I
MATERIALAM AEROFOTOS'YEMKI 1946-
6 GG.),
neaziatskii Nauchno-Issledovatelskii
rometeorologicheskii Institut, Tashkent
SR).
primary bibliographic entry see Field 02C.
-13359

OF CROSS CORRELATION BETWEEN
ROLOGICAL TIME SERIES TO IMPROVE
IMATES OF LAG ONE AUTOREGRESSIVE
AMETERS,
tute of Hydrology, Wallingford (England).
ost, and R. T. Clarke.
er Resources Research, Vol 9, No 4, p 906-
August 1973. 2 tab, 23 ref.

criptors: *Statistical methods, *Correlation
ysis, *Time series analysis, *Regression anal-
Hydrologic data, Synthetic hydrology,
istical models.
tifiers: *Cross correlation.

serially correlated hydrologic time series (y)
may also be available from a longer time se-
(x), itself serially correlated and cross corre-
with (y). On the assumption that both series
lag one autoregressions, large-sample vari-
s for the autoregressive parameter are derived
the short series alone or from both series,
the relative information was investigated nu-
cally. When the two serial correlations are ap-
imately equal and the length of (x) is twice
of (y), the gain in precision is about 4% when
cross correlation is 0.2, about 15% when the
s correlation is 0.4, about 31% when the cross
elation is 0.6, and 49% when the cross correla-
is 0.8. The equations giving maximum
ihood (ML) estimates are examined, and a
ively simple numerical technique is developed
one particular case of some practical im-
ance. The modified Matalas estimates have
ler mean square error than ML estimates, and
estimates derived from both series have
ler mean square error than ML estimates
ved from the single series only. (Knapp-
S)
-13364

AMIC COOLING.
primary bibliographic entry see Field 05B.
-13449

MAP SHOWING RANGES IN PROBABLE MAXIMUM WELL YIELD FROM WATER-BEARING ROCKS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
D. A. Webster.
Miscellaneous Field Studies Map MF-431, 1972. 1 sheet, 4 maps, 1 tab, 27 ref.

Descriptors: *Water yield, *Groundwater, *Hydrogeology, *California, *Maps, Transmissivity, Aquifer characteristics, Drawdown, Water table.
Identifiers: *San Francisco Bay region.

This map presents generalized information regarding the probable maximum yields of wells in the rocks of the San Francisco Bay region. It is intended to serve the needs of planners and other persons seeking general information on potential yields from water wells. Potential yield of wells is only one consideration in planning for water development. The history of land subsidence in the Santa Clara Valley resulting from overpumping and of bay-water intrusion of aquifers supplying wells in parts of Alameda and Contra Costa Counties, for instance, make evident the need to consider planned rates of pumping throughout areas of large well yields. (Knapp-USGS)
W73-13519

MAPS SHOWING AREAS IN THE SAN FRANCISCO BAY REGION WHERE NITRATE, BORON, AND DISSOLVED SOLIDS IN GROUND WATER MAY INFLUENCE LOCAL OR REGIONAL DEVELOPMENT,
Geological Survey, Washington, D.C.
D. A. Webster.
Miscellaneous Field Studies Map MF 432, 1972. 8 p, 5 maps, 34 ref.

Descriptors: *Water quality, *Groundwater, *California, Nitrates, Boron, Dissolved solids, Water resources development, *Maps.
Identifiers: *San Francisco Bay region.

Information is provided on the nitrate, boron, and dissolved-solids content of groundwater in the San Francisco Bay region. Places where nitrate in groundwater has exceeded 45 mg per liter, where boron has exceeded 1 mg per liter, and where dissolved solids have exceeded 2,000 mg per liter are shown on the maps by symbols. Areas where the maximum concentration of dissolved solids in groundwater generally has been less than 500 mg per liter, 500 to 1,000 mg per liter, and greater than 1,000 mg per liter, and areas for which readily available chemical quality data are lacking, are outlined. Changes in the specific conductance and approximate dissolved-solids content of groundwater at 66 wells are shown by graphs for 1960-70. (Knapp-USGS)
W73-13520

FLOOD OF MARCH 19-20, 1970, METROPOLITAN BIRMINGHAM AND JEFFERSON COUNTY, ALABAMA,
Geological Survey, University, Ala.
K. W. Causseaux.
Alabama Geological Survey Atlas Series 2, 12 sheets, 1971. 7 fig, 5 photo, 9 map.

Descriptors: *Floods, *Alabama, *Maps, *Flood stages, *Historic floods, Mapping, Water levels, Rainfall, Flood recurrence interval, Flood profiles.
Identifiers: *Flood maps, *Jefferson County (Ala).

A heavy rainstorm which included many intensive local bursts moved eastward across north-central Alabama during the morning of March 19, 1970. According to information gathered immediately after the storm, including reports from several long-time residents, it was the greatest storm in many years; in Jefferson County the highest stages of record occurred at most stream-gaging stations. Moderate to extensive flooding occurred across the State, but the greatest property damage was in Birmingham and Jefferson County. Hydrologic data collected by the U.S. Geological Survey in cooperation with the Geological Survey of Alabama during and immediately after the storm are presented. Information is shown on a series of maps depicting the extent of areas inundated by the flooded streams in metropolitan Birmingham, and the flood event is described in terms of rainfall, streamflow, and flood elevations. This report provides public agencies and private individuals with factual data for solving flood problems and planning effective utilization of land adjacent to streams. (Knapp-USGS)
W73-13521

A DIGITAL REGISTRATION SYSTEM FOR NET PHOTOSYNTHESIS AND TRANSPIRATION MEASUREMENTS IN THE FIELD AND AN ASSOCIATED ANALYSIS OF ERRORS,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
For primary bibliographic entry see Field 02D.
W73-13597

08. ENGINEERING WORKS

8B. Hydraulics

DESIGN OF EXPERIMENTS FOR ESTIMATING PROCESS DYNAMICS,
Queen's Univ., Kingston (Ontario). Dept. of Mathematics.
For primary bibliographic entry see Field 04A.
W73-13147

HYDROLOGIC AND HYDRAULIC DESIGN UNDER UNCERTAINTIES,
Illinois Univ., Urbana. Dept. of Civil Engineering.
W. H. Tang, and B. C. Yen.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 868-882, (1972). 3 fig, 1 tab, 20 ref.

Descriptors: Hydrology, *Hydraulics, *Design, Engineering, *Projects, Methodology, Probability, Design flow, Equations, Pipes, Reliability, Model studies, Systems analysis, *Risks.
Identifiers: Risk level, Storm sewers, Precipitation rate.

Uncertainties arise in various aspects and phases of hydrologic and hydraulic design of engineering projects. Previously, only hydrologic uncertainties such as basic randomness in flood or rainfall frequencies has been considered. A practical model is proposed through which all sources of uncertainties associated with a hydraulic design, including design model reliability, insufficient data, material variability, as well as hydrologic randomness etc., can be systematically analyzed, combined, and incorporated into the evaluation of the overall risk of alternative designs. Formulation leading to the selection of a design for a specified risk level is developed. In this approach, the conventional measure of risk based on frequency analysis would constitute only a part of this overall risk. An example of storm sewer design is presented to illustrate in detail the proposed formulation. Based on the assessment of uncertainties, the precipitation rate and the errors in the simplified design model are the major sources of uncertainty. A risk-based sewer pipe design curve is developed for practical purpose. For a specified risk level of 1%, the required safety factor in the design flow is shown to be about 2.0. (See also W73-13134) (Bell-Cornell)
W73-13159

OPTIMAL DESIGN STRATEGY FOR SMALL FLOOD-CONTROL STRUCTURES,
Queen's Univ., Kingston (Ontario).
W. E. Watt, and K. C. Wilson.
In: Proceedings (Vol. II), International Symposium on Uncertainities in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 903-916, (1972), 3 fig, 4 ref.

Descriptors: *Flood control, *Structures, *Design, *Economic efficiency, *Optimization, Estimating, Costs, Equations, Mathematical models, Systems analysis, *Risks.
Identifiers: *Economic analysis.

An optimal design strategy for use on a regional basis for small flood-control structures is presented. When a large number of such small structures is to be built on independent drainage basins, the total expenditure may be very large, and it is of considerable advantage to investigate the optimization process on the basis of a regional aggregate. A mathematical model is presented which is extended in two stages. First, an optimum design strategy is obtained for the 'perfect knowledge' case, assuming that economic efficiency is the objective. This strategy leads to the determination of an optimum design return period, which is a function of the exponents of the two regional cost equations, the ratio between the cost of a typical damage event and the construction cost, the effective rate and other parameters. Second, a modified strategy is developed for the 'real world' case where the uncertainities in the various parameters combine to give an overall uncertainity in estimating the optimum. It is found that the penalty resulting from an underdesign caused by this uncertainity is greater than that for an equivalent overdesign, and hence the 'real world' optimum should be larger than the estimated 'perfect knowledge' value. This increase is related to the degree of uncertainty and expressed in the form of overdesign factors applicable to discharge and return period. (See also W73-13134) (Bell-Cornell)
W73-13161

CONVECTIVE INSTABILITY IN LIQUID POOLS HEATED FROM BELOW,
Washington Univ., Seattle. Dept. of Chemical Engineering.
H. J. Palmer, and J. C. Berg.
Journal of Fluid Mechanics, Vol 47, Part 4, p. 779-787, 1971. 5 fig, 2 tab, 9 ref.

Descriptors: *Heat transfer, *Convection, *Fluid mechanics, Buoyancy, Friction, Heat flow, Heat resistance, Stability, Laboratory tests, Temperature.
Identifiers: Convective instability, Thermistors.

The linear hydrodynamic stability analysis of liquid pools heated from below combining surface tension and buoyancy effects as presented by Nield (1964) is confirmed by experiment for a series of silicone oils. The experimental method is an adaptation of the Schmidt-Milverton technique, in which the stability limit is located by the change of slope in the plot of heat flux versus temperature drop across the liquid pool. (Oleszkiewicz-Vanderbilt)
W73-13442

THERMALLY-DRIVEN LINEAR VORTEX,
Florida State Univ., Tallahassee. Dept. of Mathematics.
S. Blumsack, and A. Barcilon.
Journal of Fluid Mechanics, Vol 48, Part 4, p. 801-814, 1971. 2 fig, 1 tab, 8 ref.

Descriptors: *Heat transfer, *Vortices, *Velocity, *Mathematical models, Temperature, Shear, Shear stress, Coriolis Force, Hydraulics, Hydrostatic pressure, Mathematical studies.
Identifiers: Ekman numbers, Rossby numbers, Multi-boundary-layer structure.

Steady axially symmetric small Rossby number flows in which the driving consists of prescribed axial heat sources have been investigated. By letting the velocity be proportional to the shear at the bottom surface, the effects of that boundary condition on the resulting flows were studied. A multi-boundary-layer structure is found in the core, surrounding the heat sources. That structure depends on the relative magnitudes of the aspect ratio, stratification parameter and Ekman number. (Oleszkiewicz-Vanderbilt)
W73-13443

UNBOUNDED STRATIFIED FLOW OVER A VERTICAL BARRIER,
Case Western Reserve Univ., Cleveland, Ohio. Div. of Fluid, Thermal and Aerospace Sciences.
G. S. Janowitz.
Journal of Fluid Mechanics, Vol 58, No 2, p. 375-388, 1973. 2 fig, 9 ref.

Descriptors: *Streams, *Stream flow, *Mathematical models, *Stratified flow, Fluid mechanics, Hydraulic engineering, Model studies, Equations, Hydrologic equations, Froude number, Barriers, Forecasting.

The horizontal, linearly stratified, non-diffusive, high Reynolds number flow of an unbounded fluid over a two-dimensional vertical barrier is studied for a range of internal Froude numbers under Oseen and Boussinesq approximations. For Froude numbers >0.47 the most prominent feature of the flow is the system of large amplitude lee waves located downstream of the barrier with crests tilted in an upstream direction. For Froude numbers between 0.47 and 0.6 the crests actually extend upstream of the barrier and appear as flows of alternating direction over the barrier. For Froude numbers between 0.47 and 0.5 reversed flows due to these waves actually extend far upstream. For Froude numbers <0.47 a blocking column upstream of the obstacle, as well as large amplitude lee waves, is present. For even smaller Froude numbers the amplitude of the lee-wave system diminishes but the blocking column remains. It is also shown that the steady-state solution obtained by Trustrum for the density and pressure field is drastically altered if a small viscosity is retained in the transient analysis. (Jerome-Vanderbilt)
W73-13459

MAINTENANCE OF GREAT SOUTH BAY AND PATCHOGUE RIVER, NEW YORK, NAVIGATION PROJECT (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.

Available from NTIS, Springfield, Va. 22151 as EIS-NY-73-0071-F Price $3.00 printed copy; $1.45 microfiche. September 1972. 18 p.

Descriptors: *Dredging, *Waste disposal, *Environmental effects, *New York, Spoil banks.
Identifiers: *Environmental Impact Statements, *Great South Bay (NY), Patchogue River (NY).

Maintenance dredging of the existing Federal navigation project in Great South Bay and Patchogue River, New York, to its authorized project dimensions will be performed by contract dredge with spoiling in an existing upland disposal site. The improvement would permit the continuation of efficient and safe delivery by water of petroleum products and other commodities yielding economic benefits to the surrounding communities. Adverse environmental effects which cannot be avoided are: temporary increase in turbidity during the dredging process, which would have an impact on the water quality and shellfish resources of the area; and spoiling in the upland site, which would continue to alter the natural environmental habitat of the waterfowl inhabiting the Swan Creek area. (Knapp-USGS)
W73-13524

NEAR-SHORE RIPPLES: SOME HYDRAULIC RELATIONSHIPS,
Windsor Univ (Ontario) Dept of Geography
A. S. Trenhaile
Journal of Sedimentary Petrology, Vol 43, No 2, p 558-568, June 1973. 6 fig, 1 tab, 37 ref.

Descriptors: *Ripple marks, *Beaches, *Sedimentary structures, *Waves (Water), Hydraulic models, Wavelengths, Sedimentology, Surf, Regression analysis, Correlation analysis, Statistical methods.

Sand ripples in shallow water with small fetch were analyzed in a wave tank to investigate some aspects of the relationship between ripple geometry and hydraulic parameters. Power spectral analysis demonstrated that ripple height and wavelength increase with wave height and decrease with water depth, such that although random fluctuations are present, ripple geometry tends to increase towards the breaker point. Bed mounds tend to cause ripples to increase in size on the waveward side and decrease on the leeward side. Ripple velocity was the least well explained of the ripple parameters investigated, although velocity was shown to be related to water depth and wave height. (Knapp-USGS)
W73-13530

OSTLER LENSES: POSSIBLE ENVIRONMENTAL INDICATORS IN FLUVIAL GRAVELS AND CONGLOMERATES,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 02J.
W73-13539

DESIGN OF CASINGS AND SCREENS FOR WATER PRODUCTION AND INJECTION WELLS,
Moss (Roscoe) Co., Los Angeles, Calif.
R. Moss, Jr.
Paper presented at American Petroleum Institute Pacific Coast District Second Biennial Symposium, Anaheim, California, Dec 1964, 25 p, 8 ref, 8 tab, 8 fig.

Descriptors: *Water wells, Injection wells, *Well screens, *Design criteria, Southwest U.S., Well casings, Corrosion.
Identifiers: *Cable tool drilling, *Rotary-hydraulic drilling, Cone of depression, Double wall casing.

One of the most important contributing factors to development of the semiarid Southwestern United States has been the exploitation of the region's vast underground reservoirs. Casing and screen practices applied to the two basic well designs employed in the area are discussed. Consideration is given to installation, operation, and economic criteria for both cable-tool and rotary-hydraulic methods of well construction. (Campbell-NWWA)
W73-13568

GROUND WATER DEVELOPMENT AND MANAGEMENT IN THE OWENS VALLEY,
Department of Water and Power, Los Angeles, Calif.
For primary bibliographic entry see Field 04B.
W73-13569

8C. Hydraulic Machinery

GEOTHERMAL ENERGY--RESOURCES, PRODUCTION, STIMULATION.
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W73-13214

CHARACTERISTICS OF GEOTHERMAL RESOURCES,
Geological Survey, Menlo Park, Calif.

primary bibliographic entry see Field 03E.
3-13218

EAM PRODUCTION AT THE GEYSERS OTHERMAL FIELD,
on Oil Co. of California, Cloverdale. Big sers Station.
primary bibliographic entry see Field 03E.
3-13220

SIGN AND OPERATION OF THE GEYSERS WER PLANT,
ific Gas and Electric Co., San Francisco, Calif.
Finney.
Geothermal Energy--Resources, Production, nulation; Proceedings of Special Symposium of erican Nuclear Society, June 19-20, 1972: Stan- l University Press, Stanford, Calif., p 145-161, 3. 6 fig, 1 tab, 5 ref.

criptors: *Geothermal studies, *Electric er, *Electric power demand, *Thermal power- nts, Electric power production, Hydrogeology, ter resources development, Energy, Steam tur- es, Wells.
ntifiers: *Geothermal power, *Power demand, ysers geothermal field (Calif).

Pacific Gas and Electric Company has been aged for 15 years in the design, construction, operation of dry steam geothermal electric er generators at the Geysers, California. The t's eight turbine generator units produce a net ut of 290,000 kw. Two more 53,000-kw units scheduled to go into operation in 1973. And in , after a single unit rated at 106,000 kw goes service, the total net output of The Geysers er Plant will be 502,000 kw, making it the lar- geothermal power installation in the world. pressure-flow characteristics of the steam s vary, but in general the flowing wellhead ssures decrease with increased production s. Shut-in pressure on the wells is 450-500 psi; the steam has a constant enthalpy of 1,200- 5 Btu per lb. The most economic utilization of resource resulted with a turbine-inlet pressure 00 psig and an exhaust pressure of 4 inches Hg olute. The electric power output of the wells is bout its maximum under these turbine condi- s. At higher pressures, the increased energy lable from the steam is more than offset by the inished steam-production rates from the wells. he operating conditions selected, about 80% of turbine steam flow is evaporated in the cooling er. This means that the condensed exhaust n the turbine can be used as cooling tower eup water. Power production costs compare orably with fossil fuel steam-generating units. also W73-13214) (Knapp-USGS)
3-13221

E VAPOR-TURBINE CYCLE FOR OTHERMAL POWER GENERATION,
. Anderson.
Geothermal Energy--Resources, Production, nulation; Proceedings of Special Symposium of erican Nuclear Society, June 19-20, 1972: Stan- , Calif, p 163-175, 1973. 7 fig, 8 ref.

criptors: *Electric power, *Thermal power- ts, *Turbines, Electric power production, thermal studies, Energy, Equipment, Efficien- , Water pollution control.
ntifiers: *Vapor turbines, Isobutane.

ew geothermal power process, the vapor tur- cycle, was developed to eliminate the disad- tages inherent in the methods involving use of m. In this process the hot water brought to the ace is passed through a heat exchanger, where ves up heat to boil and superheat a high density or. The vapor then expands through a turbine produce power and is recycled to the heat nanger. The practical and economic ad- tages of this process may be great enough to turn the vast potential of geothermal energy into reality. Isobutane has the most favorable overall economics for developing power from water of about 325F. One of the important advantages of vapor turbine plant is that lower condensing temperatures can be used than are economically possible with a steam turbine plant. Since water at full pressure retains its gases in solution, the gases can be returned to the ground without danger of atmospheric pollution. (See also W73-13214) (Knapp-USGS)
W73-13222

WATER FROM GEOTHERMAL RESOURCES,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 03A.
W73-13223

STIMULATION OF GEOTHERMAL SYSTEMS,
Division of Applied Technology (AEC), Washington, D.C.
A. H. Ewing.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 217-222, 1973. 1 fig, 5 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Well stimulation.

One of the important problems in the development of geothermal resources is the necessity for proving reserves sufficient to justify the expense of constructing a powerplant directly at the site of a reservoir. The potential investment in the powerplant may be large compared to the investment already made in the exploration phase. Increased well productivity promised by artificial stimulation may make such decisions easier. The main objectives of research on the development of geothermal resources are (1) the ability to utilize the resource however it manifests itself in nature, (2) the technology necessary for efficient extraction of energy from the resource, (3) the ability to predict the productivity and longevity of the resource, and (4) the ability to develop the resource in an environmentally tolerable manner. (See also W73-13214) (Knapp-USGS)
W73-13225

GEOTHERMAL RESOURCES RESEARCH,
National Science Foundation, Washington, D.C. Div. of Advanced Technology Applications.
For primary bibliographic entry see Field 06D.
W73-13232

GEOTHERMAL POWER STILL IFFY,
For primary bibliographic entry see Field 03E.
W73-13433

HEAT-TRANSFER AGENTS FOR HIGH-TEMPERATURE SYSTEMS,
General Electric Corporate Research and Development, Schenectady, N.Y.
J. R. Fried.
Chemical Engineering, Vol 80, No 12, p. 89-93, May 28, 1973. 10 fig, 2 tab, 33 ref.

Descriptors: *Heat exchangers, *Temperature, *Thermal conductivity, *Thermodynamic behavior, *Pumping, Electric power production, Industrial plants, Facilities, Heat transfer, Heat flow, Thermal properties, Physical properties, Conduction, Fluid dynamics, Gases, Instrumentation, Materials, Mechanical engineering.

In heat transfer processes with temperatures below 32 F and above about 35o0 F substitute heat transfer agents for water are sought. Selection of the proper heat transfer agent and design of the transfer system for processes between 350 and 1000 F are treated in detail. Vapor phase systems allow greater quantities of heat transfer per pound of medium while liquid phase systems are specified when temperature control is important. The primary concern in choosing a heat-transfer medium once the system phase has been chosen is to match the process temperature requirements with the temperature range of the fluids. Other considerations are inventory cost, toxicity and ecology, flammability, thermal stability, freezing point, corrosive and fouling characteristics and pumping costs. The composition, temperature range, physical properties and pumping cost comparisons of major commercial heat-transfer fluids are listed and discussed. Several different vapor phase and liquid phase systems are described and compared. Carbon steel is the recommended construction material for all parts of the heat-transfer system in all cases except for inorganic salts above 850 F, when stainless steels are suggested. (Jerome-Vanderbilt)
W73-13446

HEATING AND COOLING IN BATCH PROCESSES,
Proctor and Gamble Co., Cincinnati, Ohio.
For primary bibliographic entry see Field 05G.
W73-13448

NOMOGRAMS SIMPLIFY DESIGN OF STEAM CONDENSERS,
A. Zanker.
Power Engineering, Vol 75, No 5, p 52-55, May 1973. 3 fig, 1 tab.

Descriptors: *Steam, *Condensers, *Design data, *Cooling water, Mechanical engineering, Heat transfer, Condensation, Heat exchangers, Design, Design criteria, Data processing, Mathematics, Equations.

The basic factors and equations relating the quantity and temperatures of steam to be condensed, the temperatures of entering and leaving cooling waters, and the heat transfer rates through the tube walls are presented for designing surface steam condensers. Although the step by step solution of these relationships is laborious and requires frequent reference to tables, charts, or graphs, the three nomograms presented greatly simplify the procedure. The first nomogram presents heat transfer rate, tube characteristic factor, and the exponent for temperature calculation. The second nomogram determines the outlet water temperature. The third determines cooling water rate, total required tube surface area and the total length of the tubes. An example is given for use of these nomograms. (Jerome - Vanderbilt)
W73-13464

PROBLEMS WITH EXCHANGERS IN ETHYLENE PLANTS,
Schmidtsche Heissdampf G.m.b.H., Kassel (West Germany).
For primary bibliographic entry see Field 08G.
W73-13465

DUAL STRING DRILLING METHOD YIELDS IMPROVED SAMPLES,
Dresser Industries, Inc., Dallas, Tex. Security Engineering Div.
E. A. Kunneman.
In: Proceedings, 12th Symposium on Exploration Drilling, University of Minnesota, School of Mining and Metallurgical Engineering, Minneapolis, Minnesota, p 195-201, 1967.

Descriptors: Drilling, *Core drilling, Drilling fluids, Sampling, *Drilling equipment.

Identifiers: *Reverse circulation, *Dual string drilling, Diamond core bits, Core breaker.

The dual string drilling concept and the merits of this system as an exploration tool have been recognized for some time. Methods of conversion of standard rotary rigs to dual string rigs are discussed, along with the mechanisms of operation of the dual string. A comparison of conventional with dual string methods is given. New developments in dual string drilling are also shown. (Campbell-NWWA)
W73-13565

CORE ORIENTATION,
Christensen Diamond Products Co., Salt Lake City, Utah.
W. F. Kempe.
In: Proceedings, 12th Annual Drilling and Blasting Symposium, University of Minnesota, School of Mining and Metallurgical Engineering, Minneapolis, Minnesota, p 161-182, 1967.

Descriptors: *Core drilling, Cores, *Sampling, Drilling, Logging (Recording), *Exploration, Mining, Methodology.
Identifiers: *Diamond drilling, *Core orientation, Coring equipment, Petroleum industry, Construction industry.

There is nothing more valuable to authoritative decision making than reliable data in sufficient quantity. For purposes of soil and substrata investigation several means are available. Those selected depend on the kind of information sought and on the type of formation to be studied. Each method accomplishes certain functions. Coring is the only direct method of formation evaluation. Coring is explored in some detail, with emphasis on in situ orientation of rocks. (Campbell-NWWA)
W73-13567

8D. Soil Mechanics

A MATHEMATICAL MODEL FOR PRELIMINARY EVALUATIONS OF CANDIDATE RESERVOIR SYSTEMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Decell.
Available from NTIS, Springfield, Va. 22151 as AD-756 119 Price $3.00 printed copy; $1.45 microfiche. Technical Report M-72-3, August 1972. 100 p, 19 fig, 5 tab.

Descriptors: *Engineering structures, *Reservoirs, *Pre-impoundment, *Reservoir design, *Mathematical models, Systems analysis, Input-output analysis, Hydrologic data, Costs, Evaluation, Correlation analysis, Reservoir storage, Storage capacity, *West Virginia.
Identifiers: *Rowlesburg Reservoir (W Va).

A mathematical model system was developed to provide an expedient method of evaluating candidate reservoirs. The models can be used to perform both functional and cost evaluations. These evaluations can then be used for comparisons of candidate reservoirs. The formulation of the models and data requirements are discussed to evaluate alternate candidates to the Rowlesburg Reservoir, West Virginia. Examples of analyses of reservoir capacity, flood storage-flow augmentation, and visitation are included. (Woodard-USGS)
W73-13529

THEORY AND PROBLEMS OF WATER PERCOLATION,
Bureau of Reclamation, Denver, Colo.
C. N. Zangar.
Bureau of Reclamation, Engineering Monograph No 8, 1953. 75 p, 57 fig, 8 tab.

Descriptors: *Groundwater movement, Percolation, Flow nets, Hydraulic gradient, *Dam design, Dam foundations, Membranes, Phreatic lines, *Analog models, Soil mechanics.
Identifiers: *Radial flow, Steady state solutions, Exit gradients, Time-drawdown method.

The flow of ground water through dams and their foundations and the accompanying pressures and gradients that exist are examined. Several methods for determining the permeability of soil by field tests are explored as well as flow problems via electric analog experiments. Both experimental and analytical solutions are discussed in detail; appendices show case problems. (Campbell-NWWA)
W73-13563

8E. Rock Mechanics and Geology

INDUCTION AND GROWTH OF FRACTURES IN HOT ROCK,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 08H.
W73-13228

8F. Concrete

EFFECT OF CALCIUM LIGNOSULFONATE ON PROPERTIES OF CONCRETE AT EARLY AGES,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05D.
W73-13644

8G. Materials

FEASIBILITY OF PLASTIC FOAM PLUGS FOR SEALING LEAKING CHEMICAL CONTAINERS,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 05G.
W73-13019

PROJECT TUGBOAT: EXPLOSIVE EXCAVATION OF A HARBOR IN CORAL,
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
For primary bibliographic entry see Field 08H.
W73-13212

WATER TREATMENT FOR HIGH PRESSURE BOILERS,
For primary bibliographic entry see Field 03F.
W73-13440

PREOPERATIONAL CLEANING OF HIGH PRESSURE STEAM SYSTEMS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 03E.
W73-13444

DRY COOLING TOWER USES STEEL STRUCTURE,
Hoterv, Budapest (Hungary).
For primary bibliographic entry see Field 05D.
W73-13451

WATER TREATMENT FOR HEATING AND PROCESS STEAM BOILERS,
For primary bibliographic entry see Field 05F.
W73-13462

PROBLEMS WITH EXCHANGERS I ETHYLENE PLANTS,
Schmidtsche Heissdampf G m b H , Kassel (We Germany)
H R Knulle
Chemical Engineering Progress, Vol 68, No 7, 53-56, July 1972 4 fig, 12 ref

Descriptors *Cooling, *Heat exchangers *Opera tion and maintenance, *Corrosion control, Hea transfer, Steam, Conduction, Heat flow Therma conductivity, Heat resistance Boilers, Boiler fee water, Design criteria, Thermal stress Equip ment, Mechanical engineering, Reliabilit Systems analysis, Heated water, Cooling water Identifiers Quench boilers

The design criteria necessary to fulfill the require ments for reliability and safety for heat transfer i quench boiler systems are discussed Formulas fo heat transfer coefficients and the ratios of tub length to diameter for power are presented Hea flow from cracked gas to water is not only deter mined by the heat transfer on the gas side, but als by heat resistance in the tube wall and between th water and the wall Heat resistance on the wate side has an essential influence on the excess tem perature of the tube. The elastic behavior of th heated tube is discussed according to the force applied from outside the tube and by therma stresses related to the heat flow through the tub wall Good durability in a water/steam operation i only guaranteed if the natural passive layer on th water side is maintained. The formation of a mag netite layer, while it cannot halt corrosion, wi slow it to a point where it is not a major factor Besides the mechanical design, feed water qualit and methods of operation are important to equip ment reliability. (Jerome - Vanderbilt)
W73-13465

MAGNETIC TREATMENT OF WATER.
Informatics, Inc., Rockville, Md.
For primary bibliographic entry see Field 05F.
W73-13544

8H. Rapid Excavation

PROJECT TUGBOAT: EXPLOSIVE EXCAVA TION OF A HARBOR IN CORAL,
Army Engineer Waterways Experiment Statio Livermore, Calif. Explosive Excavation Researc Lab.
W. C. Day.
Available from NTIS, Springfield, Va 22151 a AD-754 534 Price $3.00 printed copy; $1.4 microfiche. Technical Report TR E-72-23, Februa ry 1972. 205 p, 185 fig, 41 tab, 43 ref.

Descriptors: *Explosives, *Explosions, *Rock ex cavation, *Hawaii, *Harbors, Seismic studies, En vironmental effects, Coastal engineering, Crater Seismic waves, Coral.

A portion of a planned small-boat harbor i Kawaihae Bay, Hawaii, was explosively ex cavated in a weak coral material. The charges wer emplaced approximately 36 ft deep in the cor reef which was overlain with a water layer averag ing approximately 6 ft in depth. Charges wer spaced 100 and 120 ft apart. An additional array o sixteen 1/2-ton charges was subsequently em placed and detonated to clear that portion of th channel. The detonations resulted in a channe varying in width from about 150 to 260 ft at minimum project water depth of 12 ft. Th berthing basin is almost a square area 400 ft on side at the 12-ft water depth contour. The explo sive craters were broad and shallow with no lip and were actually better suited to harbor excava tion than the less wide and deeper craters typica of dry land cratering detonations. The craterin mechanism appears to be one of densification o the coral through crushing and subsequent settling

sults of a wave measurement program, a study the effect of the detonations on the marine en-onment, a ground-motion measurement pro-m, a structures response study, an airblast mea-ement program, and a measurement program to ermine the peak pressure and the acceleration velocity of the water directly over the charge itions are also included. (Knapp-USGS)
3-13212

COVERY OF GEOTHERMAL ENERGY OM HOT, DRY ROCK WITH NUCLEAR EX-OSIVES,
telle-Northwest, Richland, Wash. Geothermal grams.
. Burnham, and D. H. Stewart.
Geothermal Energy--Resources, Production, nulation; Proceedings of Special Symposium of erican Nuclear Society, June 19-20, 1972: Stan-l University Press, Stanford, Calif, p 223-230, 3. 5 fig, 1 tab, 6 ref.

scriptors: *Nuclear explosions, *Geothermal lies, *Electric power, Thermal powerplants, ter resources development.
ntifiers: *Project Plowshare, *Geothermal ver.

Plowshare geothermal concept entails the eration of power from the energy contained in osits of hot, dry rock. The rock is fractured by array of sequentially fired, fully contained lear explosives; when fracturing is complete, er is injected through fill pipes and steam is ndrawn to the surface facility. One cubic mile ock at 350C, when cooled to 150C, would yield sable energy equivalent to that of 300 million rels of oil--an amount, at present oil prices, th approximately $1 billion. (See also W73-14) (Knapp-USGS)
3-13226

PLOSIVE STIMULATION OF HYDROTHER-L RESERVOIRS,
nford Univ., Calif. Dept. of Petroleum En-eering.
. Ramey, Jr., P. Kruger, and R. Raghavan.
Geothermal Energy--Resources, Production, nulation; Proceedings of Special Symposium of erican Nuclear Society, June 19-20, 1972: Stan-l University Press, Stanford, Calif, p 231-249, 3. 5 fig, 2 tab, 11 ref.

scriptors: *Geothermal studies, *Electric ver, *Electric power demand, *Thermal power-nts, *Nuclear explosions, Electric power duction, Hydrogeology, Water resources elopment, Energy, Steam turbines, Wells, Ex-sives.
ntifiers: *Geothermal power, *Well stimula-.

stimulation of geothermal fluid production n hydrothermal aquifers for producing steam generate electricity appears to be technically sible. Several methods of production are possi-to optimize the recovery of the heat stored in geothermal aquifer. Explosive stimulation is of the more promising methods. For surface avations with shallow depth burial, chemical losives have proved useful in yields of up to und 5 kt. In deeper formations, the emplace-nt of large volumes of explosives and the higher nation temperatures limit the practical explo-yield. Nuclear explosives, which become re efficient in size and cost for yields above ut 3 kt, have proved useful for large-volume turing of underground formations. Special lear explosives are being designed for use in p emplacement wells of diameters usually used the oil and gas industry. Methods for the op-um removal of geothermal fluids must be based a thorough knowledge of the recovery chanisms operating within the reservoir, includ-fluid expansion, liquid vaporization, and the segregation of liquid and vapor, as well as the influx of fluids from adjacent or underlying aquifers. The deposition and production of minerals must be considered, as well as the environmental effects due to the explosion and subsequent geothermal production. (See also W73-13214) (Knapp-USGS)
W73-13227

INDUCTION AND GROWTH OF FRACTURES IN HOT ROCK,
Los Alamos Scientific Lab., N. Mex.
M. Smith, R. Potter, D. Brown, and R. L. Aamodt.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 251-268, 1973. 8 fig, 1 tab, 16 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells.
Identifiers: *Geothermal power, *Well stimulation, *Hydraulic fracturing.

Widespread use of geothermal energy will be facilitated if a way can be found to produce it from hot, relatievely dry rock by circulating a fluid introduced from the surface through the rock and bringing the heated fluid (probably water) back to the surface. Some concepts of how this might be done are discussed. Hydraulic fracturing is begun by pumping water from the surface into a borehole. When the borehole becomes sufficiently pressurized, a tensile crack will form somewhere along its margin. The fracture will grow as the pumping continues, and will continue to grow as long as water can be pumped in fast enough to exceed the leakage taken off by the permeability of the rock. Thermal stresses will create new cracks, preferentially near the source of the first one, where the water is coldest, and these cracks may also propagate under the high pressure exerted at that point. At the present state of the drilling art, it would probably not be practical to drill holes deeper than about 20,000 ft. (See also W73-13214) (Knapp-USGS)
W73-13228

CHEMICAL EXPLOSIVE STIMULATION OF GEOTHERMAL WELLS,
Naval Weapons Center, China Lake, Calif. Research Dept.
C. F. Austin, and G. W. Leonard.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 269-292, 1973. 14 fig, 14 ref.

Descriptors: *Geothermal studies, *Explosives, *Water wells, Wells, Injection wells, Electric power, Thermal powerplants, Hydrogeology, Water resources development.
Identifiers: *Geothermal power, *Well stimulation.

Explosive stimulation of geothermal wells appears to be feasible with today's technology. Blasting in a bore hole can increase the flow rates into the hole. The increase is accomplished by destruction of grain-to-grain bonding, by destruction of physical blockages of fractures and pores, or by the creation of entirely new fractures. The use of explosive charges to increase the effective diameter of a well through fracture propagation or to enhance the nearby porosity has the advantages that the equipment required is minimal, little weight need be handled, and little or no junk is likely to remain in the hole. To be successful, the explosive stimulation of a geothermal well requires the careful understanding and matching of three major factors: (1) the method of explosive energy delivery; (2) the type of host rock; and (3) the fluid phase in the formation. (See also W73-13214) (Knapp-USGS)
W73-13229

ENVIRONMENTAL ASPECTS OF NUCLEAR STIMULATION,
Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.
G. M. Sandquist, and G. A. Whan.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 293-313, 1973. 5 fig, 2 tab, 30 ref.

Descriptors: *Environmental effects, *Nuclear explosions, *Wells, *Geothermal studies, Thermal powerplants, Water pollution sources, Radioactive wastes, Seismic studies.
Identifiers: *Well stimulation, *Geothermal power.

Because the development of geothermal energy resources is attractive from environmental and economic standpoints, the utilization of nuclear explosives to stimulate latent geothermal sites merits examination. However, the contained underground detonation of one or more nuclear devices raises considerable questions and problems that demand critical evaluation. Deep dry-rock stimulation seems at this time to favor the use of very large (200- to 1,000-kt) explosives, which would produce severe environmental impact from seismic effects. Geothermal aquifer stimulation would make use of smaller nuclear devices, but because of the probable affinity to tectonic plate boundaries of the geologic formations addressed by this application, the potential environmental impact of radioactive contamination would be a serious concern, as would possible induced seismic fault movement. The excellent safety record of the Plowshare Program is reassuring. There have been no personal injuries, only minor damage to structures, and minimal impact on the environment attributable specifically to the detonations. (See also W73-13214) (Knapp-USGS)
W73-13230

CORROSION AND SCALING IN NUCLEAR--STIMULATED GEOTHERMAL POWER PLANTS,
California Univ., Livermore. Lawrence Livermore Lab.
O. H. Krikorian.
In: Geothermal Energy--Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 315-334, 1973. 1 fig, 5 tab, 22 ref.

Descriptors: *Environmental effects, *Nuclear explosions, *Wells, *Geothermal studies, *Corrosion, *Scaling, Thermal powerplants, Water pollution sources, Radioactive wastes, Seismic studies.
Identifiers: *Well stimulation, *Geothermal power.

The experience gained with corrosion and scaling in natural geothermal powerplants makes it apparent that similar problems are likely to be encountered with nuclear stimulation. These problems can be explored more fully by performing exposure tests on alloy coupons in geothermal steam and water under the proposed nuclear application conditions. It is important in such tests that the compositions of the steam and the water be representative of the particular geothermal formation. Steam taken directly from a nuclear well would be most desirable; or, lacking an actual well, it may be possible to infer the impurities to be expected in the steam from analyses of core samples from the formation. It seems likely, as has been the case for natural geothermal wells, that suitable alloys and other construction materials for turbine systems can be found through such screening tests. (See also W73-13214) 9Knapp-USGS)

W73-13231

8I. Fisheries Engineering

MARICULTURE COMES OF AGE,
H. S. Gordon.
Chemical Engineering, Vol 79, No 17, p. 26-28, August 7, 1972. 1 fig.

Descriptors: *Aquiculture, *Marine fisheries, *Research and development, *Heated water, Marine biology, Chemistry, Marine animals, Shrimp, Oysters, Lobsters, Salmon, Shellfish farming, Economics, Model studies, Experimental farms, Prototypes, Technology, Utilities, Thermal powerplants, Reproduction, Effluents, Cycles, Growth rates, Sewage, Algae.

Current state of development of and future possibilities are reviewed for the controlled cultivation of seafood stocks-mariculture. Experiments which are underway examine the possibilities for controlled environment hatcheries which would optimize the reproduction and maturation cycles of shrimp, oysters, lobsters and salmon. Experiments for salmon cultivation have shown signs of success, but the prime interest of U.S. companies centers on shrimp. Several large corporations have made investigations of shrimp production and Texas A and M University in cooperation with Central Power and Light Company of Texas is planning studies to determine the effects of high local salinity on shrimp growth and development, the effects of salinity on shrimp under different feeding conditions, and the feasibility of shrimp production on a 1,150 acre man-made cooling lake. Utilities have been investigating the possibility of mariculture in their thermal effluents. Sewage may prove useful for algae farms, which would provide food for mariculture projects. Some technical problems involved in mariculture are the reconditioning of hatchery water, the prevention of disease and the development of equipment resistant to salt water corrosion. (Jerome-Vanderbilt)
W73-13452

TESTS OF VARIATIONS OF THE ABERNATHY SALMON DIET, 1970,
Bureau of Sport Fisheries and Wildlife, Longview, Wash. Salmon-Cultural Lab.
L. G. Fowler, J. L. Banks, and J. W. Elliott.
U S Bur Sport Fish Wildl Tech Pap, 61, p 3-13, 1972, Illus.
Identifiers: *Abernathy salmon, Germ, Oncorhynchus-tshawytscha, *Salmon diet, Tests, Wheat, Feeding trials.

The 1970 fall chinook salmon (Oncorhynchus tshawytscha) feeding trials indicated that dry pelleted diets were equal to moist pelleted diets with similar formulations. A superior diet was produced by reducing the ratio of dried whey product and wheat germ meal to 1:1 and eliminating cottonseed meal. This formulation fed at a 45% protein level was more efficient than other protein levels fed. Growth was not reduced when the soybean oil supplement was lowered from 6% to 2% of the diet. Two corn distillers' products that were substituted as partial replacements for dried whey product did not enhance fish growth. Storage of the Abernathy dry pellet at room temperature did not alter the nutritional adequacy of the diet.--Copyright 1973, Biological Abstracts, Inc.
W73-13499

09. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT. 1971-1972. NEW JERSEY WATER RESOURCES RESEARCH INSTITUTE.
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.

August 1972. 94 p, 4 fig, 118 ref. OWRR A-999-NJ (9).

Descriptors: *New Jersey, *Research, *Projects, Water pollution control, Hydrology, Hydraulics, Estuaries, Biological oxygen demand, Salinity, Water quality, Environmental effects, Oysters, Sites, Development, Waste discharge, *Water resources Institute.
Identifiers: *Delaware Estuary.

Research progress and prospects are summarized for 1971-1972. Projects concerning hydrology and hydraulics, environmental impacts of man's activities, stream oxygenation and BOD, othe pollution and biological problems, and institutional and political studies are discussed. Specific topics that deal with estuaries include: the effects of salinity and other water quality parameters on N.J. oyster beds; evaluation of estuarine site development lagoons; the Delaware estuary system; spatially and temporally distributed discharge of effluents in estuaries; and atmospheric aeration in an estuary. (Ensign-PAI)
W73-13545

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

CHANGING TIMES FOR WATER RESEARCH AND TECHNOLOGY TRANSFER,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W73-13038

10C. Secondary Publication And Distribution

NITRIFICATION AND DENITRIFICATION - A SELECTED BIBLIOGRAPHY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05B.
W73-13085

TRENDS IN METHODOLOGY FOR EVALUATION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS,
Fisheries Research Board of Canada, West Vancouver, (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 05C.
W73-13171

A LITERATURE SURVEY OF OCEAN POLLUTION,
Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering.
For primary bibliographic entry see Field 05B.
W73-13211

AQUATIC, BIOENVIRONMENTAL STUDIES IN THE COLUMBIA RIVER AT HANFORD 1945 -1971. A BIBLIOGRAPHY WITH ABSTRACTS,
Battelle-Pacific Northwest Labs., Richland, Wash
For primary bibliographic entry see Field 05B
W73-13409

RADIOACTIVE WASTE MANAGEMENT - A BIBLIOGRAPHY OF PUBLICLY AVAILABLE LITERATURE PERTAINING TO THE USAEC'S HANFORD, WASHINGTON PRODUCTION SITE.
Technical Information Center (AEC), Oak Ridge, Tenn.
For primary bibliographic entry see Field 05B.
W73-13414

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1970-1971, SECOND ANNUAL ISSUE,
Colorado State Univ., Fort Collins. Dept of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-13472

THERMAL EFFECTS ON AQUATIC ORGANISMS, ANNOTATED BIBLIOGRAPHY OF 1971 LITERATURE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W73-13478

10F. Preparation of Reviews

TRENDS IN METHODOLOGY FOR EVALUATION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS,
Fisheries Research Board of Canada, West Vancouver, (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 05C.
W73-13171

ECOLOGICAL EFFECTS OF OFFSHORE DREDGING AND BEACH NOURISHMENT: A REVIEW,
University of Southern Mississippi, Hattiesburg.
For primary bibliographic entry see Field 05C.
W73-13290

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED POROUS MEDIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 05B.
W73-13302

POTENTIAL FOR THE USE OF COBALT-60 IR RADIATION IN THE TREATMENT OF WASTE WATERS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05D.
W73-13401

SUBJECT INDEX

4-D
Avoidance of Pesticides by Grass Shrimp (Palaemonetes pugio),
W73-13173 5C

BALONE
Laboratory Observations on the Early Growth of the Abalone, Haliotis Sorenseni, and the Effect of Temperature on Larval Develooment and Settling Success,
W73-13428 5C

BATEMENT SCHEDULES
Pollution Abatement Programs in the Delaware River Estuary,
W73-13164 5G

BERNATHY SALMON
Tests of Variations of the Abernathy Salmon Diet, 1970,
W73-13499 8I

BLATION
Average Albedo Values of Glaciers During the Ablation Season (O srednikh znacheniyakh al'bedo lednikov v period ablyatsii),
W73-13357 2C

BRAMOV GLACIER
Glaciology of Soviet Central Asia (Glyatsiologiya Sredney Azii).
W73-13350 2C

BRAMOV GLACIER (USSR)
Meteorological Conditions in the Abramov Glacier Basin (Meteorologicheskiye usloviya basseyna lednika Abramova),
W73-13351 2C

Heat Balance of Surfaces of the Abramov Glacier and Lateral Moraine in Summer (Teplovoy balans poverkhnostey lednika Abramova i beregovoy moreny v letniy period),
W73-13352 2C

Mass Budget of the Abramov Glacier (Byudzhet massy lednika Abramova),
W73-13353 2C

Suspended-Sediment Yield from the Abramov Glacier Basin (Stok vzveshennykh nanosov s basseyna lednika Abramova),
W73-13355 2C

Radar Sounding of the Abramov Glacier (Radiolokatsionnoye zondirovaniye lednika Abramova),
W73-13356 2C

BSORPTION
Uptake and Accumulation of DDT and PCB by Ephemera Danica (Ephemeroptera) in Continuous-Flow Systems,
W73-13265 5C

Freshwater Ecology.
W73-13341 5B

Plutonium Studies.
W73-13344 5B

Use of Hanford Waste Ponds by Waterfowl and Other Birds,
W73-13404 5C

Methodology for the Identification of a Biological Indicator in Radioecology: Example of CS137 and a Freshwater Mollusc Anodonta, (Methodologie Pour La Recherche D'un Indicateur Biologique En Radioecologie),
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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VOLUME 6, NUMBER 22
NOVEMBER 15, 1973

W73-13651 -- W73-14200

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 6, NUMBER 22
NOVEMBER 15, 1973

W73-13651 – W73-14200

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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**E OF THE ELECTRON MICROSCOPE
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swell Park Memorial Inst., Buffalo, N.Y. Elec-
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r primary bibliographic entry see Field 02B.
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**DROLOGIC ENGINEERING METHODS
R WATER RESOURCES DEVELOPMENT:
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OCEDURES.**
drologic Engineering Center, Davis, Calif.
primary bibliographic entry see Field 08B.
3-13757

**ATUS AND TRENDS OF RESEARCH IN
DROLOGY, 1965-74.**

c. of International Conference held at
ESCO Headquarters, December 8-16, 1969,
s: United Nations Educational, Scientific and
tural Organization, Paris, 1972. 148 p.

criptors: *Water balance, *Data collections,
ernational Hydrological Decade, Precipitation
nospheric), Hydrology, Surface waters,
und water, Sedimentation, Networks,
drologic cycle.
ntifiers: *World water balance.

s tenth volume in the Studies and Reports in
drology series presents the proceedings of the
rnational Conference on the Practical and
ntific Results of the International Hydrologi-
Decade and on International Cooperation in
rology, held at UNESCO Headquarters in
s from December 8-16, 1969, in pursuance of
lution 2.332 adopted by the Unesco General
ference at its fifteenth session. The aims of the
ference were to stimulate further active par-
ation in the decade by member states, and to
le member states to assess the progress of the
vities conducted within the framework of the
de and to consider the needs and possibilities
long-term program of action. The conference
with three main topics: (a) a review of the
accomplished during the first half of the
de; (b) the preparation of proposals for future
of the decade and for possible changes in
tion of the program; and (c) an exchange of
s on a long-term plan of action in the field of
ology. Six scientific papers discuss the most
rtant problems of the International Hydrolog-
Decade program. (See W73-13766 thru W73-
4) (Knapp-USGS)
-13765

**RLD WATER BALANCE: REPORT OF
GRESS,**
ogical Survey, Washington, D.C.
Nace, A. A. Sokolov, and V. A. Ouryvaev.
tatus and Trends of Research in Hydrology,
-74; Proc. of International Conference held at
SCO Headquarters, December 8-16, 1969,
: United Nations Eductional, Scientific and
ral Organization, Paris, p 15-29. 1972. 1 tab,
, append.

riptors: *Water balance, *Data collections,
rnational Hydrological Decade, Precipitation
ospheric), Hydrology, Surface waters,
Ground Water, Sedimentation, Networks, Hydrologic cycle.
Identifiers: *World water balance.

The Working Group on the World Water Balance has initiated the following activities: compilation of a bibliography of pertinent references; estimation of long-term avearage amounts of water participating in the hydrological cycle and of water in the several realms where it accors; compilation of data on the transportation of dissolved and suspended solids in water; and study of variations of hydrological phenomena. Several member states have published national water-balance estimates, but many States do not have sufficient data to do so. For the world as a whole, more information is available about surface runoff than about any other phenomenon in the land phase of the water cycle. Even so, data are lacking or inadequate for about two-thirds of the land area for runoff and all other parameters. Among steps taken to accelerate acquisition of data and understanding is improved cooperation among international intergovernmental agencies in hydrological studies. WMO, FAO and IAEA have been especially productive. Even closer collaboration between hydrologists and meteorologists, however, is necessary. Under the stimulus of the IHD and the Coordinating Council, more and more countries are systematizing hydrological dataprograms and publication of data. Thereby, previously unavailable data are becoming available for regional analyses. Data that are still notoriously deficient, however, concern the discharge of suspended and dissolved solids by rivers into the seas. Much remains to be done also in the development and standardization of instruments and analytical methods for obtaining and processing data. (See also W73-13765) (Knapp-USGS)
W73-13766

INFLUENCE OF MAN ON THE HYDROLOGICAL CYCLE: GUIDELINES TO POLICIES FOR THE SAFE DEVELOPMENT OF LAND AND WATER RESOURCES.

In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris: United Nations Educational, Scientific and Cultural Organization, Paris, p 31-70, 1972. 2 fig, 101 ref.

Descriptors: *International Hydrological Decade, *Environmental effects, *Hydrologic cycle, *Land use, Water pollution, Erosion, Sedimentation, Urbanization, Political aspects, Ecology, Water resources development, Legislation, Regulation, Legal aspects, Social aspects.
Identifiers: *World water balance.

The sciences and technologies involved in the measurement of hydrological results of changes in land use are reviewed. Evidence from large-scale catchment studies of experimental changes in land use, as distinct from tests on small plots, is still scarce and is reviewed in some detail. Records of experience of the hydrological effects of major land use changes are scattered among many departments in each country. Positive land use policies are needed for forest lands, grasslands, arable land, irrigation and salinity, swamp drainage, urbanization, water pollution, landslides, road construction, and the location of danger areas in very large catchments. In technically advanced countries the pressures of economic forces are rewarding the good and penalizing the bad land use policies so that progressive improvement is occurring. Water pollution remains the most serious problem and this will be overcome only at high cost with support of strong public opinion to secure enactment and enforcement of legislation. In developing countries rapid increases of population are resulting in unplanned proliferation of subsistence agriculture, without the means or the discipline to protect natural resources. Provision of fertilizers, of improved seeds, and of financial credit to permit their use is recommended as the most direct means to combat soil erosion and to protect land and water resources. Discipline in the use of water resources for irrigation and their protection from pollution is advised as a high priority. Education alone is ineffective since the application of technical knowledge too often fails through political inertia. (See also W73-13765) (Knapp-USGS)
W73-13767

SOIL EROSION AND TRANSPORT OF SOLIDS BY STREAMS, (EROSION DU SOL ET TRANSPORTS SOLIDES DES COURS D'EAU).

In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris: United Nations Educational, Scientific and Cultural Organization, Paris, p 71-83, 1972. 2 tab, 6 ref.

Descriptors: *Sedimentology, *Sedimentation, *Sediment transport, *International Hydrological Decade, *Erosion, Research and development, Soil erosion, Silting, Bed load, Suspended load.
Identifiers: *World water balance.

Research in erosion by water, sedimentation in deltas and dams the mechanisms of transport (especially of bed-loads), the relations between fluid and solid discharge, radioisotopes, and other methodological studies are reviewed. To implement the IHD project on estimation of global sediment transfer to the ocean and erosion in the various ecological zones of the world, systematic measuring work will have to be continued and stepped up. It will be necessary to arrange to collate the data submitted by the countries during the decade with a view to making the final estimates. Recourse would also have to be made to extrapolation in order to apply known values to regions where no measurements have been made. In order to form a complete picture of how much sediment is being transferred to the ocean, it is necessary to carry out measurements of dissolved matter. The Continental Erosion Commission of the IASH could offer a convenient venu for specialists and provide the framework for final collation of data. (See also W73-13765) (Knapp-USGS)
W73-13768

STATUS AND TRENDS IN HYDROLOGICAL FORECASTS: PART A, FORECASTING OF RUN-OFF, RIVER AND LAKE LEVEL, ICE CONDITIONS AND SURFACE-WATER TEMPERATURE,
P. I. Miljukov.
In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris: United Nations Educational, Scientific and Cultural Organization, Paris, p 85-100, 1972. 55 ref.

Descriptors: *Runoff forecasting, *Streamflow forecasting, *Water temperature, *International Hydrological Decade, Data collections, Data processing, Stream gages, Snowmelt, Water yield, Water balance.
Identifiers: *World water balance.

Hydrological forecasting constitutes one of the essential aspects of applied hydrology and one which is of interest to many sectors of a country's economy. The past activities of the World Meteorological Organization (WMO), in the field of hydrological forecasting are summarized. The types of hydrological forecasting and of the main fundamental methods employed are reviewed. Examples are given of methods for short-term forecasting of levels and discharges which are based on the evaluation of the volume of water in a river or on

calculation of the movement of the water in a river bed. Also described are methods of long-term forecasting of volumes of flow following the melting of ice and snow. Despite the introduction of electronic calculating machines which have all but eliminated the problems of complex calculations in hydrological forecasting, the question of observation still remains to be solved, both from a technological and a theoretical viewpoint. Improved techniques, especially the installation of automated systems for the acquisition and processing of hydrometeorological data, should increase the efficiency of hydrological forecasting; international cooperation is essential if progress is to be made in this field. (See also W73-13765) (Knapp-USGS)
W73-13769

STATUS AND TRENDS IN HYDROLOGICAL FORECASTS: PART B, FORECASTING OF GROUND WATER, SOIL MOISTURE AND SEDIMENTATION.

In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris: United Nations Educational, Scientific and Cultural Organization, Paris, p 101-112, 1972. 21 ref.

Descriptors: *Groundwater, *Soil moisture, *Sedimentation, *International Hydrological Decade, Research and development, Transmissivity, Diffusivity, Specific yield, Storage coefficient, Hydrogeology.
Identifiers: *World water balance.

Groundwater forecasting is concerned with changes that may be brought about in hydrogeological systems by natural or external causes. Difficulties are encountered in evaluating precisely aquifer constants and boundary conditions. Even though there now exist methods for computing certain basic parameters (such as coefficients of transmissibility, storage and specific yields), no methods have yet been developed for the computation of coefficients of diffusion, absorption or crossflow. Further theoretical and practical research is needed. Fundamental research is very important in the field as well as in the laboratory. (See also W73-13765) (Knapp-USGS)
W73-13770

NETWORK PLANNING AND DESIGN: PART A, REVIEW OF SCIENTIFIC APPROACHES AND PROBLEMS IN HYDROLOGICAL NETWORK DESIGN,
J. C. Rodda.
In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris. United Nations Educational, Scientific and Cultural Organization, Paris, p 113-125, 1972. 1 fig, 1 tab, 60 ref.

Descriptors: *Data collections, *Network design, *Hydrologic data, Data processing, International Hydrological Decade, Gaging stations, Telemetry, Remote sensing, Variability, Systems analysis.
Identifiers: *World water balance, Information theory.

Concepts of network design are reviewed stressing the present state of the science, recent developments and trends. Many present networks are inadequate partly as a result of lack of adequate criteria for design of networks. A network collects ordered data to achieve a given objective. Methods of analysis and synthesis of data could help define objectives for a network. For instance, mapping or regionalization could determine accuracy criteria for extrapolation as well as those criteria to be used in network design. More recent developments use information theory concepts for network design, and use the primary-secondary station concept, in which the primary stations sample time variability and the secondary stations sample spatial variability. The balance between the two types of stations is determined by the relative information content and eventually the value of each type of data should be related in economic terms, in order that the various kinds of hydrological networks could be used to their full extent on a joint basis. (See also W73-13765) (Knapp-USGS)
W73-13771

NETWORK PLANNING AND DESIGN: PART B, NETWORK DESIGN FOR OBSERVATION OF WATER QUALITY, SEDIMENT TRANSPORT, GROUND WATER, AND SOIL MOISTURE.

In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris: United Nations Educational, Scientific and Cultural Organization, Paris, p 126-130, 1972.

Descriptors: *Data collections, *Network design, *Surveys, *Hydrologic data, Data processing, International Hydrological Decade, Gaging stations, Telemetry, Remote sensing, Variability, Systems analysis.
Identifiers: *World water balance, Information theory.

A survey was made of network design for water quality, sediment transport, groundwater and soil moisture in the countries participating in the IHD. Some networks are very rudimentary and are intended to serve as a basis for further expansion, while others only function locally but are very close-knit so as to deal with some specific practical problem. As regards their purpose each of the networks falls into one of three categories: networks for the evaluation of resources for planning purposes; networks for studying the relationship between the parameter studied and a hydrological characteristic already observed in a conventional network of adequate density (for example, the relationship between the level of groundwater reservoirs and surface waters); and network providing basic data for further studies of the problem. The number of networks dealing with all four types of data (water quality, sediment transport, groundwater, and soil moisture) and organized on a national basis is small and progress in their organization therefore depends primarily on action at the national level. (See also W73-13765) (Knapp-USGS)
W73-13772

THE PROBLEM OF FLOODS AND THEIR COMPUTATION,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. A. Sokolov, and D. L. Sokolovskii.
In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris: United Nations Educational, Scientific and Cultural Organization, Paris, p 131-139, 1972. 24 ref.

Descriptors: *Flood forecasting, *International Hydrological Decade, Floods, Statistical methods, Probability, Data collections, Flood frequency, Flood recurrence interval.
Identifiers: *World water balance.

The methods presently in use for the computation and forecasting of floods are reviewed. These methods are based on statistical study and on analysis of the genesis of past floods and can be divided into two categories: empirical or semi-empirical methods which calculate the maximum discharge of a flood by using data such as the surface area of the basin and the intensity of the precipitation; and methods based on the genesis of the flood (isochrones, unit hydrographs, mathematical models) based on the study of the transformation of snowmelt and rainfall water into a flow hydrograph by the watershed. The lack of information on the computation of probable frequency of catastrophic floods means that methods of statistical forecasting based on the probability of exceptional rainfall are of interest. An international survey of methods of study and computation of floods in use in different regions and the establishment of a world catalogue of floods observed in different countries would be the first steps in the preparation of and international guide on the computation of floods. (See also W73-13765) (Knapp-USGS)
W73-13773

A PHYSICS-BASED APPROACH TO HYDROLOGIC RESPONSE MODELING: PHASE II: APPLICATIONS,
IBM Watson Research Center, Yorktown Heights, N. Y.
R. A. Freeze
Completion Report, June 1973, 11 p, 9 ref. OWRR-C-4072 (9016) (1)

Descriptors: *Subsurface runoff, *Snowmelt, *Mathematical models, Base-flow, *Idaho, Saturated flow, Unsaturated flow, Unsteady flow, Small watersheds, Basalts, Risks, Computer models, Monte Carlo method, Model studies.
Identifiers: *Hydrologic response model, Deterministic flow equations, Stochastic parameter distributions, *Reynolds creek experimental watershed.

A mathematical model of subsurface flow is used to complement a field study of snowmelt runoff in a small upstream source area in the Reynolds Creek Experimental Watershed near Boise, Idaho. Field measurements from an instrumented cross-section show that the mechanism of streamflow generation is subsurface delivery of melt-water over limited distances through shallow, high-permeability, low-porosity formations of altered and fractured basalt. The mathematical model provides a two-dimenstional, transient, saturated-unsaturated analysis of the subsurface flow at the field site. It proved to be a valuable aid to a unified interpretation of the field measurements. For mathematical models that consist of boundary-value problems with boundary conditions that are temporally and spatially dependent, the boundary-condition sensitivity can thwart the rational calibration-validation procedure. This, together with the more serious limitations of data availability and computer capacity, precludes the imminent use of fully-deterministic hydrologic response models on a regional scale. A brief summary of the project is reported. (See also W73-03257).
W73-13854

INFILTRATION AND ANTECEDENT PRECIPITATION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W73-13965

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 07A.
W73-13989

EXTENT OF THE PEARSON III LAW: THE CASE OF NEGATIVE SKEWNESS (EXTENSION DE LA LOI PEARSON III: LE CAS DE L'ASYMETRIE NEGATIVE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 07A.

V73-13990

ERRORS IN THE ESTIMATION OF HYDROLOGIC VARIATES IN THE CASE OF PEARSON III LAW (ERREURS SUR L'ESTIMATION DES VARIATES HYDROLOGIQUES DANS LE CAS DE LA LOI PEARSON III),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 07A.
V73-13993

DETERMINATION OF PEAK DISCHARGE OF A MEDIUM-SIZED WATERSHED FOR THE REQUIRED FREQUENCY BY SIMPLIFIED RATIONAL METHOD,
ant Coll of Tech., Pantnagar (India).
). Mukherjee.
ndian Geohydrology (Calcutta), Vol 8, No 2, p 59-0, December 1972. 4 fig, 3 ref.

Descriptors: *Rational formula, *Peak discharge, Rainfall-runoff relationships, Time of concentration, Runoff forecasting.

A simplified rational method was evolved so that he peak discharge of a specific frequency can be omputed in a short time from meteorological and oil data. Watershed area is generally measured rom contour maps or air photos. Main channel lope should represent the average slope, excluding the upper, intermediate and lower relatively eep reaches. Time permitting, the slope should e calculated from contour maps. Shape factor is a easure of the elongation of the watershed. The egree of elongation of the watershed has an imortant effect on the time of concentration. (K-app-USGS)
V73-14121

SOME ASPECTS OF HYDROMETEOROLOGY,
ndia Meteorological Dept., New Delhi.
. Koteswaram.
ndian Geohydrology (Calcutta), Vol 8, No 1, p 10-2, June 1972.

Descriptors: *Data collections, *Hydrologic data, Meteorological data, *Flood forecasting, Warning systems, Streamflow forecasting, Snowmelt.
Identifiers: *India.

India ranks high among the countries of the world in the field of hydrometeorology. The importance of systematic measurements of rainfall has been recognized in India for more than 100 years. There are about 4500 ordinary rain-gage stations distributed over the country. In addition, there are about 350 recording rain gages which give a continuous record of rainfall and provide valuable information about short-duration rainfall values. Snow gages have been set up at a number of stations located in the Himalayas. The hourly, daily and monthly data of these stations have been put on punched cards. They are thus available for being fed into modern electronic computers for the calculation of any required rainfall statistics. Evaporation data using the standard Class 'A' pan evaporimeters are being recorded at a network of about 120 stations in India and these data are available for nearly a decade. The Regional Forecasting Offices of the India Meteorological Department at Bombay, Calcutta, Madras, Nagpur and New Delhi are issuing weather and flood forecasts and heavy rainfall warnings pertaining to areas under their jurisdiction. Flood forecast centers provide information about river levels and forecast of river levels during the flood season at desired points along the main rivers and their tributaries and issue warnings of high water levels to add executive authorities and to general public. The India Meteorological Department is cooperating in this venture by providing necessary weather forecasts through its Regional Meteorological Centers. (Knapp-USGS)
W73-14124

MATHEMATICAL MODELING OF STREAMFLOW (MATEMATICHESKOYE MODELIROVANIYE RECHNOGO STOKA),
L. S. Kuchment.
Gidrometeoizdat, Leningrad, 1972. 192 p.

Descriptors: *Streamflow, *Model studies, *Mathematical models, Computer models, Input-output analysis, Hydrographs, Discharge (Water), Runoff, Storm runoff, Overland flow, Snowmelt, Floods, Routing, Streamflow forecasting, Watershed (Basins), Rivers, Mathematics, Optimization, Fourier analysis, Laplaces equation.
Identifiers: USSR, Deterministic models, St. Venant equations.

Methodology of building mathematical models of runoff and use of these models in hydrologic forecasts and computations are discussed. Watershed and channel models are constructed on the basis of input and output observations, and special attention is paid to inverse problems and to determination of parameters in the model. Methods proposed for solution of these problems for individual models are based on the theory of incorrectly formulated problems and optimization techniques, and examples are given of the practical application of classical methods of mathematical physics to streamflow modeling. (Josefson-USGS)
W73-14142

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL III.
For primary bibliographic entry see Field 06A.
W73-14166

A METHODOLOGY FOR TESTING SYSTEM THEORETIC MODELS,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 06A.
W73-14172

2B. Precipitation

WATER RESOURCE OBSERVATORY WIND AND SOLAR RADIATION DATA-WATER YEAR 1972,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W73-13660

ESTIMATE OF THE CONTENT OF SPRAY DROPS IN THE NEAR-WATER LAYER OF THE ATMOSPHERE,
L. Yu. Preobrazhenskii.
Fluid Mechanics--Soviet Research, Vol 2, No 2, p 95-100, March-April 1973. 3 fig, 2 ref.

Descriptors: *Drops (Fluids), *Particle size, *Air-water interfaces, *Atmosphere, Air circulation, Winds, Storms, Waves (Water), Height, Estimating, Analytical techniques, Anemometers, Curves, Equations.
Identifiers: USSR.

Spectral composition and concentration of spray drops transported by air currents in lower layers of the atmosphere above the sea were determined during an expedition by the Main Geophysical Observatory to the North Atlantic in the fall of 1969. Research was carried out when winds were moderate (6-10 m/sec) and wave height was 1.5-2.5 m and when winds were strong (15-25 m/sec) and wave height was 4-6 m. Maximum concentrations were observed for drops having diameters ranging from 0.0005 cm to 0.0030 cm. In moderate winds, 1 cu m of air contains 100 to 1,000 particles and in strong winds, 1,000 to 10,000 particles. Spray-drop concentration decreases as particle size and distance from the surface increase. The largest particles observed at a height of 1.5 m have a diameter ranging from 0.0130 cm to 0.0150 cm. Under stormy conditions, maximum spray-drop sizes observed at a height of 2 m range from 0.0500 cm to 0.2000 cm, and their concentration is low (1 cu m of air contains 1 to 20 large drops). Particles having diameters smaller than 0.0200 cm reach a level of 4 m and those having a diameter of 0.0090 cm reach a level of 7 m. Distribution of spray-drop concentrations by size and height, and vertical distribution of water content in lower layers of the atmosphere are graphed for cases of moderate and strong winds. (Josefson-USGS)
W73-13690

WATER RESOURCE OBSERVATORY, WIND DATA, WATER YEARS 1970 AND 1971,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W73-13714

ESTIMATION OF AVERAGE DAILY RAINFALL FROM SATELLITE CLOUD PHOTOGRAPHS,
National Environmental Satellite Service, Washington, D.C.
W. A. Follansbee.
Available from NTIS, Springfield, Va. 22151 as COM-73-10539 Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum NESS 44, January 1973. 39 p, 14 fig, 15 15 tab, 17 ref.

Descriptors: *Weather forecasting, *Rainfall, *Aerial photography, *Clouds, Methodology, Satellites (Artificial), Climatology, Mathematical studies, Correlation analysis.

In the past 5 years a number of investigators have made progress in the development of techniques for estimating rainfall from meteorological satellite imagery. A simple technique is described for estimating the average daily rainfall over subsynoptic scale areas in the tropics and subtropics. The procedure is to determine the percentage of a given area covered by each of three rain-producing cloud types (cumulonimbus, nimbostratus, and cumulus congestus); these percentages are multiplied by empirically established coefficients to obtain the rainfall contribution to be expected from each cloud type. The method was tested for Zambia, Thailand, California, Florida, and the south central United States; results were encouraging. Weighting factors to adapt the technique to the heaviest rainfall stations of India were derived. (Woodard-USGS)
W73-13750

RAINFALL INTENSITY INSTRUMENTS AND MEASUREMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
C. M. Fullerton, and D. J. Raymond.
Available from the National Technical Information Service as PB-223 010, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 67, June 1973. 32 p, 9 fig, 1 tab, 6 ref. OWRR B-024-HI (2) 14-31-0001-3575.

Descriptors: *Instrumentation, Networks, *Precipitation (Atmospheric), Rainfall, *Rainfall intensity, *Rain gages, *Hawaii, Measurements.

Two instruments have been used to measure the rate of rainfall from tropical clouds over the windward coast of the Island of Hawaii. The Workman intensity gauge employes strain gauges to sense the deflection in a movable trough and hence the flow of water down the trough. The Raymond-Wilson gauge, a new instrument developed during this program, measures the electrical resistance of flowing water to determine the rainfall rate. These instruments were deployed in a small scale array

of eight gauges to measure space and time variations in high intensity rainfall as showers move across the network. Comparative measurements were made with a standard weighing rain gauge, a tipping bucket rain gauge and the Jardi rate of rainfall gauge. Both the Workman gauge and the Raymond-Wilson gauge are clearly superior to the other instruments, because of their rapid response time and their capacity to measure high intensity showers continuously and automatically. The Raymond-Wilson gauge contains no moving parts and is operationally more suitable than the Workman gauge for deployment in a network of gauges. A sensor which measures the rate of change of atmospheric pressure has also been developed and is being used in the research program. An example of rainfall intensity measured during a 43-day period in October and November, 1972, is presented, along with a preliminary estimate of the in-cloud liquid water content of shallow Hawaiian clouds.
W73-13816

BIOCLIMATIC REGIONS OF THE GLOBE WITH SPECIAL CONSIDERATION TO THE AREA OF POLAND: PHYSIOLOGICAL AND BIOCLIMATIC ASSUMPTIONS FOR THE REGIONALIZATION OF THE BIOCLIMATE OF THE GLOBE,
Polish Academy of Sciences, Zabrze. Zaklad Badan Naukowych Gornoalaskiego Okregu Przemyslowego.
M. Gregorczuk.
Ekol Pol. Vol 19, No 47, p 807-852, 1971. Illus.
Identifiers: *Bioclimates, Climatic conditions, Physiological factors, *Poland, *Regionalization.

Tentative bioclimatic regionalization of the globe was done on the basis of an analysis of the distribution of isolines of biometeorological indices over the globe in Jan. and July and according to a 7-grade scale of thermal sensibility and responses of human organism to thermal stimuli of the environment. Isanomalous lines of bioclimatic indices in Poland and the position of the territory of Poland on the background of bioclimates of the globe are presented.--Copyright 1973, Biological Abstracts, Inc.
W73-13911

RELATIONSHIP BETWEEN STREAM WATER TEMPERATURE AND AMBIANT AIR TEMPERATURE (RELATION ENTRE LA TEMPERATURE DE L'EAU D'UNE RIVIERE ET LA TEMPERATURE DE L'AIR AMBIANT),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 02E.
W73-13992

CONSTRUCTION AND USE OF AN INEXPENSIVE RAIN GAUGE,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 07B.
W73-14003

USE OF THE ELECTRON MICROSCOPE HYDRATION CHAMBER TO STUDY SMALL WATER DROPS,
Roswell Park Memorial Inst., Buffalo, N.Y. Electron Optics Lab.
W. Chang.
In: Proceedings 31st Annual Meeting Electron Microscopy Society of America, New Orleans, La., Aug 14-17, 1973. Edited by J. Arceneaux. Claitor's Publishing Division, Baton Rouge, La. p 16-17. 1973. 4 fig, 3 ref.

Descriptors: *Water properties, *Drops (Fluids), *Laboratory equipment, *Electron microscopy, Dropwide condensation, Evaporation, Physical properties, Water structure, Analytical techniques, Cloud physics, Clouds, Air temperature, Saturation, Super-saturation, Temperature, Humidity, Moisture, Thin films, Crystallography.

A modified hydration chamber for electron microscopes has been developed which can be used as an observable micro-atmosphere to study droplet formation, evaporation, coalescence into rain drops, freezing into hail, and related phenomena as functions of supersaturation and temperature. In the specific study reported, which illustrates the utility of the technique, droplet formation and growth on polystyrene-modified carbon film substrates were recorded photographically or on video tape. The observed mode radius (radius corresponding to the maximum number of droplets) was 0.16 micron, which is one order of magnitude less than that observed in clouds. Densitometric contrast measurements suggested that water does not possess strong scattering properties and hence would not hinder the imaging of wet objects in the electron microscope. They also suggested that the structure of water is not crystalline but mainly amorphous. Electron diffraction of thin water layers on different substrates will be used to shed further light. (Brown-IPC)
W73-14024

SOME ASPECTS OF HYDROMETEOROLOGY,
India Meteorological Dept., New Delhi.
For primary bibliographic entry see Field 02A.
W73-14124

SOME CURRENT PROBLEMS OF RAIN STIMULATION RESEARCH,
California Univ., Berkeley. Statistical Lab.
For primary bibliographic entry see Field 03B.
W73-14179

2C. Snow, Ice, and Frost

A CLOSE-INTERVAL SYRINGE SAMPLER,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 07B.
W73-13719

IMPLICATIONS OF WASTE TREATMENT PROCESSES AND ARCTIC RECEIVING WATERS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W73-13748

HYDROLOGIC RECONNAISSANCE OF STREAMS AND SPRINGS IN EASTERN BROOKS RANGE, ALASKA--JULY 1972,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-13759

AN EMPIRICAL METHOD OF ESTIMATING DAILY AVERAGE BASINWIDE SNOWMELT,
Geological Survey, Menlo Park, Calif.
S. E. Rantz.
Available from NTIS, Springfield, Va., 22151 as PB-222 066 Price $3.50 printed copy; $1.45 microfiche. Water-Resources Investigations 14-73, June 1973. 27 p, 5 fig, 4 tab, 4 ref.

Descriptors: *Snowmelt, *Water yield, *Snow surveys, *Routing, Runoff forecasting, Water measurement, Streamflow forecasting, California.

The traditional but relatively unreliable degree-day method of computing daily snowmelt was modified by the addition of a daily index of the areal extent of the snowpack. The index used is actually a computed index of daily water equivalent of the pack. Because a fairly close relation often exists between water equivalent and areal extent of the snowpack at the start of the melt season, a relation also often exists during the melt season between the water-equivalent index and the snowpack area. The proposed method can be readily modified to make use of any available data from a pressure-pillow snow gage in the basin. Once obtained, the daily basinwide snowmelt values are used as input to a hydrologic routing model to compute daily values of snowmelt runoff (Knapp-USGS)
W73-13761

MODELING SNOWMELT RUNOFF IN AN ARCTIC COASTAL BASIN,
For primary bibliographic entry see Field 05B.
W73-14109

PRELIMINARY GEOLOGIC APPLICATION OF ERTS-1 IMAGERY IN ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-14129

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
For primary bibliographic entry see Field 07B.
W73-14130

WATER RESOURCES,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-14135

THE EARTH RESOURCES PROGRAM OF THE CORPS OF ENGINEERS,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-14136

MODERN GLACIERS IN THE ZARAFSHAN RIVER BASIN (SOVREMENNOYE OLEDENENIYE V BASSEYNE R. ZARAFSHAN).

Izdatel'stvo 'Fan', Tashkent, O. P. Shcheglova, editor, 1972. 84 p.

Descriptors: *Glaciology, *Glaciohydrology, *Glaciers, Mountains, Ice, Snowpacks, Snowmelt, Melting, Regimen, Heat balance, Albedo, Water balance, Runoff, Hydrographs, Glacial drift, Sea level, Water chemistry, Meteorology, Weather data, Synoptic analysis, Model studies.
Identifiers: USSR, *Soviet Central Asia, *Zarafshan River basin, Glacier mass balance, Glacier recession.

Morphology, regimen, and hydrologic characteristics of mountain glaciers were investigated in the Zarafshan River basin, one of the principal water arteries of the Uzbek and Tadzhik Republics. Results are presented of meteorological and actinometric investigations on the large Zarafshan Glacier in 1946 and of heat-balance and hydrochemical studies on the small Imat Glacier in 1965-66. (Josefson-USGS)
W73-14144

2D. Evaporation and Transpiration

HEAT AND WATER VAPOR EXCHANGE BETWEEN WATER SURFACE AND ATMOSPHERE,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
W. H. Brutsaert.
Copy available from GPO Sup Doc as EP1.23/2:73-259, $0.90; microfiche from NTIS as PB-222 939, $1.45. Environmental Protection Agency Technology Series Report EPA-R2-73

9, May 1973. 59 p, 10 fig, 1 tab, 26 ref. EPA Pro-
ct 16130 DIP.

scriptors: *Evaporation, *Heat transfer, *Air-
ter interfaces, Estimating equations, Mass
nsfer, Water cooling, *Water vapor, Diffusion.
ntifiers: *Turbulent diffusion.

e physical and mathematical aspects of simul-
eous turbulent heat and water vapor exchange
ween a large open water body and the sur-
nding atmosphere were studied. Thus analyti-
and numerical solutions were developed for
ious conditions of fetch, surface roughness, at-
spheric stability, etc., that are likely to be of
sical importance. One of the main findings was
t in spite of some theoretical limitations the
ni-empirical turbulent diffusion model provides
nethod for the prediction of heat and water
or transfer, that should be useful for engineer-
calculations. Although the interaction between
mentum, sensible heat and water vapor is con-
erable, for evaporation or cooling calculation
poses it is probably permissible to uncouple
r transfer mechanisms provided the water sur-
e temperature is known and the averaging
iod under consideration is about a week. In ad-
on the validity of the semi-empirical assump-
n in the near-water surface layer was analyzed
determining the anisotropy of the eddy dif-
ivity, the effects of radiative transfer and of
er wave action on the eddy diffusivity. Finally,
ractical method was developed to determine
potranspiration from the surrounding land sur-
e based on the geostrophic drag concept. (EPA)
3-13663

**SIGN OF SYSTEMATIC DRAINAGE WITH
APORATION AND TRANSPIRATION,**
N. Kononenko.
id Mechanics--Soviet Research, Vol 2, No 2, p
31, March-April 1973. 3 fig, 2 tab, 4 ref.

scriptors: *Groundwater movement,
ainage, *Seepage, *Evaporation, *Transpira-
, Water supply, Water level fluctuations,
ter table, Land reclamation, Drains, Mathe-
ics, Laplaces equation, Curves.
ntifiers: USSR, Boussinesq equation.

problem of groundwater dynamics in a
nogeneous medium is considered in the case of
page flow under conditions of supply and
poration. A solution is presented for the
arized Boussinesq equation for measurements
nomentary and uniform changes in water levels
a linear relationship between evaporation in-
ity and groundwater depth. (Josefson-USGS)
3-13693

**TUAL POTENTIAL AND EQUILIBRIUM
APORATION FOR A BEAN FIELD IN
UTHERN ONTARIO,**
Master Univ., Hamilton (Ontario). Dept. of
graphy.
. Davies.
ic Meteorol. Vol 10, No 4/5, p 331-348, 1972. Il-

ntifiers: *Beans, *Canada (Ontario), *Evapora-
, Heat flux, Humidity, Radiation, Soils, Sur-
, Temperature, Wind speed, Transpiration.

poration from a row crop of beans in southern
ario, Canada, was examined within the com-
tion model framework using
rometeorological measurements of tempera-
, humidity, wind speed, net radiation and soil
flux collected during 10 days in 1970. Actual
poration values were higher than anticipated
the 30-40% vegetation ground cover but in
ping with the high ratio (80-95%) of transpiring
ace to ground plan area. Equilibrium evapora-
compared closely (to within 10%) with actual
poration on 6 days when the atmosphere was
humid and the ground was moderately dry.
Poorer agreement was obtained on the other days which were cooler and less humid. Wind profile and silhouette analyses showed that the bean crop was aerodynamically smoother than the crop height would suggest. Values of surface resistance were calculated from actual and potential evaporation, air temperature and aerodynamic resistance. These showed a response to changes in soil moisture and were related to the ratio of actual evaporation to available energy. Potential evaporation was significantly larger than actual evaporation and close to the net radiation.--Copyright 1973, Biological Abstracts, Inc.
W73-13721

ECO-PHYSIOLOGICAL INVESTIGATIONS ON WILD AND CULTIVATED PLANTS IN THE NEGEV DESERT: II. THE INFLUENCE OF CLIMATIC FACTORS ON CARBON DIOXIDE EXCHANGE AND TRANSPIRATION AT THE END OF THE DRY PERIOD,
Hebrew Univ., Jerusalem (Israel). Avdat Research Farm.
E. D. Schulze, O. L. Lange, and W. Koch.
Oecologia (Berlin), Vol 8, No 4, p 334-355, 1972, Illus.
Identifiers: Artemisia-herba-alba-D, *Carbon dioxide exchange, Citrullus-colocynthus-D, Climatic conditions, Datura-metel-D, Deserts, Hammada-scoparia-D, Light, *Negev Desert, Noaea-mucronata-D, Plants, Prunus-armeniaca-D, Reaumuria-negevensis-D, Salsola-inermis-D, Stomata, Temperature, *Transpiration, Vitus-vinifera-D, Wild, Zygophyllum-dumosum-D.

Species studied included: dominant species on the natural vegetation (Artemisia herba-alba, Hammada scoparia, Noaea mucronata, Reaumuria negevensis, Salsola inermis, Zygophyllum dumosum), cultivated plants receiving rainfall and run-off water during the winter season in the run-off farm Avdat (Prunus armeniaca, Vitis vinifera), and irrigated cultivated plants receiving additional water during the summer season (Citrullus colocynthis, Datura metel). Light saturation of net photosynthesis was reached at 60-90 klx conforming to the high solar radiation intensities of the desert. Maximum rates of CO2 uptake per unit of dry weight for the irrigated mesomorphic plants was 10 times that of the wild plants. In comparison to the other species, maximal rates of CO2 uptake for wild plants were higher when calculated on a leaf area basis than when represented on a dry weight basis. Maximum rates of net photosynthesis per unit chlorophyll content for some of the wild plants (Salsola and Noaea) were comparable to those of the cultivated Vitis and irrigated Citrullus and Datura. Hammada exhibited even higher rates than Prunus. Maximum rates of net photosynthesis of Hammada were measured when the temperature of the photosynthetic organs was 37 deg C; at 49 deg C photosynthesis was only reduced by 50%. Leaf temperature affects plant gas exchange by influencing stomatal aperture. Diffusion resistance of leaves to water vapor was reduced at low temperatures and increased at high temperatures. Reduction of net photosynthesis and transpiration of desert plants at midday may, therefore, be the result of temperature-induced stomatal closure. The possible influence of peristomatal transpiration on stomatal aperture is also discussed. (See also W73-01072)--Copyright 1972, Biological Abstracts, Inc.
W73-13792

IRRIGATION RATES AND WATER LOSSES DURING IRRIGATION (POLIVNAYA NORMA I POTERI VODY PRI OROSHENII),
For primary bibliographic entry see Field 03F.
W73-14146

2E. Streamflow and Runoff

FLOODS OF DECEMBER 1971 IN WESTERN ARKANSAS,
Geological Survey, Little Rock, Ark.
R. C. Gilstrap.
Arkansas Geological Commission Water Resources Summary No 8, 1973. 26 p, 5 fig, 3 tab, 5 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *Flood frequency, *Arkansas, Precipitation (Atmospheric), Streamflow, Flow rates, Gaging stations, Hydrologic data, Data collections, Rainfall-runoff relationships, Flood discharge, Streams.

Heavy rains of December 1971 in western Arkansas caused record-breaking floods on many streams. Heavy rains began on December 8 and continued to December 10. The heaviest rain fell from the afternoon of December 9 to the early morning of December 10. Maximum accumulated rainfall for the 40-hour period exceeded 13 inches at Vandervoort. Most notable of the floods was on Ouachita River near Mount Ida, where there is a continuous record since 1941. The peak stage of 38.62 feet was 6.44 feet higher than the previous known maximum, which occurred in 1960, and the corresponding discharge of 95,500 cubic feet per second (cfs) was 67% greater than the previous known maximum. Lake Ouachita near Hot Springs and Nimrod Lake near Nimrod had the maximum computed peak inflows of 160,000 cfs and 80,000 cfs, respectively, for periods of record. No lives were lost as a result of the floods, but property damage was about $2,780,000. (Woodard-USGS)
W73-13668

FLOODS IN NEW YORK--1971,
Geological Survey, Albany, N.Y.
F. L. Robison.
Open-file report, 1973. 33 p, 7 fig, 2 tab.

Descriptors: *Floods, *New York, Data collections, Rainfall-runoff relationships, Hurricanes, Storms, Snowmelt.

The most damaging floods in New York in 1971 were caused by Tropical Storm Doria. The center of this storm passed over the northern part of New York City about 5 a.m. on August 28 and continued over land in a northeasterly direction into western Connecticut. In addition to the damage from the floods of Tropical Storm Doria in the southeastern region, a large part of the other damage reported in 1971 was also in the same region. In every month except January and September, flooding occurred somewhere in the New York City area or the lower Hudson River valley. Staten Island was especially hard hit by several storms. February ice jams caused some flooding at Utica, Mohawk, Herkimer, and Ilion in the central and eastern regions, and at Silver Creek, Sunset Bay, and the Buffalo area in the western region. During the months of April through September, heavy, short-duration rains and thunderstorms caused various degrees of flooding at many sites in the State. (Knapp-USGS)
W73-13673

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
L. F. Land, H. G. Rodis, and J. J. Schneider.
Geological Survey Open-file report 73006, 1972. 117 p, 40 fig, 5 tab, 21 ref.

Descriptors: *Water resources, *Groundwater resources, *Surface waters, *Florida, *Water quality, Chemical analysis, Water yield, Water wells, Aquifer characteristics, Pumping, Drawdown, Specific capacity, Groundwater recharge, Rainfall, Streamflow, Canals, Hydrologic data, Data collections, Water supply, Water utilization.

Identifiers: *Eastern Palm Beach County (Fla).

Rapid population growth in the eastern coastal areas of Palm Beach County, Florida, places increasing demands on the water resources of the area and locally has created critical problems. Groundwater from the shallow aquifer, a hydrologic unit comprised of the Biscayne, Pamlico and Anastasia Formations, underlies the entire area and is the principal source of water for most uses. The top of the Floridan aquifer, a limestone under high artesian pressure, underlies the area at depths ranging from 800 to 1,000 feet below land surface but the water is too salty for most uses. Specific capacities of municipal wells range from about 10 to more than 350 gallons per minute per foot of drawdown. Municipal pumping averaged about 75 million gallons per day during 1970. West Palm Beach is the only community which uses surface water for municipal supply. Total dissolved solids of the freshwater in the shallow aquifer system ranges from 200 to 300 mg/liter in the coastal ridge to more than 500 mg/liter in the western areas. In the surface water system, the water containing the least amount of dissolved solids, generally less than 200 mg/liter, occurs in Canal 18 and Canal M immediately downstream from the Loxahatchee Slough. (Woodard-USGS)
W73-13675

FLOODS OF 1971 AND 1972 ON GLOVER CREEK AND LITTLE RIVER IN SOUTHEASTERN OKLAHOMA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 07C.
W73-13680

A CASE OF PLANNED PERCOLATION OF LIQUID FROM TWO PARALLEL CHANNELS,
Kiev State Univ. (USSR).
For primary bibliographic entry see Field 08B.
W73-13694

HYDROLOGIC RECONNAISSANCE OF STREAMS AND SPRINGS IN EASTERN BROOKS RANGE, ALASKA--JULY 1972,
Geological Survey, Anchorage, Alaska. Water Resources Div.
J. M. Childers, C. E. Sloan, and J. P. Meckel.
Basic-data report, 1973. 25 p, 20 fig, 1 tab, 6 ref.

Descriptors: *Flood forecasting, *Streamflow, *Flood peak, *Alaska, Mathematical studies, Regression analysis, Flow rates, Springs, Water quality, Water temperature, Aerial photography, Flood recurrence interval, Chemical analysis, Geology, Topography, Surveys.
Identifiers: *Eastern Brooks Range (Alaska).

Estimates of bankfull discharge and maximum evident flood peak discharge by slope-conveyance methods were made for selected streams in the eastern Brooks Range, Alaska, based on field observations. Flood discharges for 2-year and 50-year average recurrence intervals were estimated for the same sites using regression equations that relate flood discharge to basin physical and climatic characteristics. Discharge, temperature, and specific conductance of selected springs were measured during the reconnaissance and water samples were collected for chemical analysis. All but one of the springs discharged from limestone bedrock or associated colluvial and alluvial deposits. Water from the springs is of the calcium bicarbonate type and has low total dissolved solids. Discharge, at time of measurement, ranged from about 4 to 36 cfs and temperature ranged from about 3 to 9C. (Woodard-USGS)
W73-13759

THE PROBLEM OF FLOODS AND THEIR COMPUTATION,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02A.
W73-13773

WAVE FORCES ON PILE INCLUDING DIFFRACTION AND VISCOUS EFFECTS,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 08B.
W73-13963

IRROTATIONAL FLOW WITH IRREGULAR BOUNDARY SHAPES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-13964

RELATIONSHIP BETWEEN STREAM WATER TEMPERATURE AND AMBIANT AIR TEMPERATURE (RELATION ENTRE LA TEMPERATURE DE L'EAU D'UNE RIVIERE ET LA TEMPERATURE DE L'AIR AMBIANT),
National Inst. of Scientific Research, Quebec.
D. Cluis.
INRS-Eau Technical Report No 3, July 1972. 11 p, 1 tab.

Descriptors: *Water temperature, *Air temperature, Streams, *Mathematical models, Measurement, Heat budget, Climatology.

The water temperature of streams and rivers is required for various practical purposes and is frequently obtained by calculating the heat budget. This method is tedious and yields rather inaccurate values for water temperature. This paper presents an alternative approach, using inexpensive and simple measurements of air temperature. It is demonstrated that a useful separation can be made between the seasonal cyclic variations and the daily stochastic fluctuations of temperature. (INRS-Eau)
W73-13992

KINEMATICS OF WATER PARTICLE MOTION WITHIN THE SURF ZONE,
Naval Postgraduate School, Monterey, Calif.
R. Steer.
Available from NTIS, Springfield, Va. 22151 as AD-756 523; Price $3.00 printed copy; $1.45 microfiche. M Sc Thesis, September 1972. 56 p, 25 fig, 7 ref.

Descriptors: *Kinetics, *Ocean waves, *Surf, *Ocean currents, Measurement, Current meters, Methodology, Velocity, Density, Energy, Tides.
Identifiers: Breaking waves, Water particle motion.

The kinematics of the water particle motion within the surf zone and within breaking waves was studied. Simultaneous measurements of sea surface elevation and horizontal and vertical particle velocities at 39 and 69 cm elevations in the column of water of 130 cm total depth were made inside the surf zone. Also, the offshore sea surface elevation at this location was measured for purposes of comparison. The velocities were measured using electromagnetic flow meters, and the sea surface elevation was measured using pressure wave gages. Probability density functions, pdf, were determined for each record. The pdf's for the sea surface elevation and particle velocities inside the surf zone were highly skewed. Spectral computations show that the range of significant energy was between 0.05 and 0.6 hertz. The phase angle was compared to linear wave theory and shows a shifting of phase for the horizontal velocity with sea surface elevation from 0 deg at low frequency to 90 deg at higher frequencies. The energy-density spectra show that the horizontal component is approximately 95% of the total kinetic energy of the surf zone. In the range of significant energy, a coherence of about 0.9 was found for the sea surface elevation and particle velocities which indicates that the particle motion inside the sur zone is for the most part wave-induced (Woodard USGS)
W73-14105

WATER RESOURCES OF THE YEL LOWSTONE RIVER VALLEY, BILLINGS TO PARK CITY, MONTANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14115

STUDIES OF TIDAL EFFECTS ON THE RIVE ZUARI, GOA,
Geological Survey of India, Calcutta.
A. Subramanian.
Indian Geohydrology (Calcutta), Vol 8, No 2, p 7 85, December 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Tides, *Tidal streams, *Water qua ty, *Saline water intrusion, Tidal effects, Salinit Tidal waters, Streamflow.
Identifiers: *India (Goa).

Tidal effects are felt deep inland in the rivers flo ing in the Union Territory of Goa. An attempt h been made to study the fluctuations in river stag on the river Zuari due to tides and their bearing the quality of the river water. The effects were st died at two stations. Significant improvement water quality was observed during low tides. Su improvement in the quality of water during l tides can be taken advantage of for cyclic develo ment of water resources from tidal rivers. (Knap USGS)
W73-14119

DETERMINATION OF PEAK DISCHARGE A MEDIUM-SIZED WATERSHED FOR TI REQUIRED FREQUENCY BY SIMPLIFIED R TIONAL METHOD,
Pant Coll of Tech., Pantnagar (India).
For primary bibliographic entry see Field 02A.
W73-14121

METHODS OF CALCULATING PARAMETE OF TURBIDITY CURRENTS (O METODA RASCHETA PARAMETROV SUSPENZIO NYKH POTOKOV),
Akademiya Nauk SSSR, Moscow. Institut O anologii.
N. V. Pykhov, and V. V. Longinov.
Okeanologiya, Vol 12, No 5, p 911-923, S tember-October 1972. 1 fig, 24 ref.

Descriptors: *Oceanography, *Turbidity curre Slopes, Density, Reynolds number, Bounc layers, Froude number, Chezy equat Mannings equation, Velocity, Turbule Suspension, Suspended solids, Equati Reviews.
Identifiers: USSR.

A critical review is presented of Soviet and for literature published in 1950-70 on methods of c puting parameters of turbidity currents. evaluation is made of the ways selected by ferent authors to construct a theory of turb currents and of the reliability of methods prop to compute their parameters. Greatest obstacl construction of a rigorous theory of turbidity rents are lack of field data and unreliability o perimental coefficients used. (Josefson-USGS
W73-14140

SOME KINEMATIC CHARACTERISTICS SURF SWASH (NEKOTORYYE CHERTY K MATIKI PRIBOYNOGO POTOKA),
Akademiya Nauk SSSR, Moscow. Institut anologiya.
N. S. Speranskiy.
Okeanologii, Vol 12, No 5, p 855-859, Septer October, 1972. 3 fig, 5 ref.

criptors: *Oceanography, *Waves (Water), rf, Beaches, Shores, Velocity, Energy equa-, Photography, Measurement, Curves.
ntifiers: USSR, *Kinematics (Waves).

asurements were made of surf swash velocity er different wave conditions on sandy-pebbly ches in western Kamchatka using motion pic- photography. Variations in velocity of wave ush and backwash are examined as a function listance from the breaker zone. An empirical nula expressing maximum uprush velocity as a ction of wave parameters is derived for use in casting velocities of flow generated by storm es. (Josefson-USGS)
3-14141

THEMATICAL MODELING OF STREAM-W (MATEMATICHESKOYE DELIROVANIYE RECHNOGO STOKA),
primary bibliographic entry see Field 02A.
3-14142

ODS IN BIG ROCK QUADRANGLE, RTHEASTERN ILLINOIS,
logical Survey, Washington, D.C.
primary bibliographic entry see Field 07C.
3-14154

TROPY IN THE ASSESSMENT OF UNCER-NTY IN HYDROLOGIC SYSTEMS HAVIOR AND IN MATHEMATICAL MODEL RFORMANCE,
fornia Univ., Davis.
primary bibliographic entry see Field 06A.
3-14170

. Groundwater

ALUATION OF HYDROLOGICAL PROPER-S OF AQUITARDS AND THEIR ROLE IN OUNDWATER MANAGEMENT,
ifornia Univ., Berkeley. Dept. of Civil En-eering.
. Witherspoon.
ilable from the National Technical Informa- Service as PB-222 935, $2.75 in paper copy, 5 in microfiche. Technical Completion Report LA-WRC-W-279, (1973), 5 p. OWRR B-123-L (2) and B-137-CAL (2). 14-31-0001-3262 and 1-0001-3561.

criptors: *Aquitards, *Hydrologic properties, akage, Groundwater recharge, Pump testing, ne water intrusion, Management, *California, oundwater movement.
ntifiers: Oxnard (Calif), Newark-Fremont lif).

s research was aimed at developing improved hods of evaluating the hydrologic properties of itards and investigating the effect of the move-nt of water through aquitards on regional undwater flow patterns and water quality. Field mping tests from an earlier investigation of a y aquifer system in the Oxnard area of Califor- provided data that were analyzed. It has been nd that a simple method of evaluating the draulic properties of the aquitard is to measure wdown in the aquitard, s', and compare it to drawdown, s, in the adjacent aquifer that is ng pumped. The ratio s'/s can be directly corre-d with the hydraulic properties of the aquitard. ther work has shown that the ratio method uld also be applicable in areas where there are ional changes in head resulting from water hdrawal at one or more points in a groundwater in. A second field test of the ratio method was rted in the Newark-Fremont area of California emplacing piezometers in an aquitard overlying aquifer where degradation of groundwater is coming severe through salt water intrusion. By end of this project, not enough data had been collected to enable a further evaluation of the ratio method, but an unexpected development during the emplacement of piezometers in the aquitard layers has revealed that unusually high concentrations of salt are present in the pore waters of those aquitard layers that are located beneath salt evaporation ponds in the area.
W73-13653

STRUCTURAL AND STRATIGRAPHIC FRAMEWORK, AND SPATIAL DISTRIBUTION OF PERMEABILITY OF THE ATLANTIC COASTAL PLAIN, NORTH CAROLINA TO NEW YORK,
Geological Survey, Washington, D.C.
P. M. Brown, J. A. Miller, and F. M. Swain.
Available from GPO, Washington, D C 20402, $50.00 including plates. Professional Paper 796, 1972. 79 p, 13 fig, 59 plate, 2 tab, 177 ref.

Descriptors: *Hydrogeology, *Stratigraphy, *Structural geology, *Atlantic Coastal Plain, Permeability, Sedimentology, Sedimentation, Maps, Mapping, Geologic mapping, Cross-sections, Subsurface mapping.

Adetailed subsurface mapping program was undertaken in the part of the Atlantic Coastal Plain which extends from the South Carolina and North Carolina border through Long Island, N.Y. Data obtained from more than 2,200 wells are analyzed. Seventeen chronostratigraphic units are mapped in the subsurface. They range in age from Jurassic (question) to post-Miocene. The purpose of the mapping program was to determine the external and internal geometry of mappable chronostratigraphic units and to derive and construct a permeability-distribution network for each unit based upon contrasts in the textures and compositions of its contained sediments. A structure map and a combined isopach, lithofacies, and permeability-distritution map for each of the chronostratigraphic units delineated in the subsurface are included. Also included is a map of the top of the basement surface. These maps, together with 36 stratigraphic cross sections, present a three-dimensional view of the regional subsurface hydrogeology. They provide focal points of reference for a discussion of regional tectonics, structure, stratigraphy, and permeability distribution. Taken together and in chronologic sequence, the maps constitute a detailed sedimentary model, the first such model to be constructed for the middle Atlantic Coastal Plain. The series of combined isopach, lithofacies, and permeability-distribution maps, together with the series of structure-contour maps, illustrate the distribution of intrinsic permeability. (Knapp-USGS)
W73-13666

DESIGN OF SYSTEMATIC DRAINAGE WITH EVAPORATION AND TRANSPIRATION,
For primary bibliographic entry see Field 02D.
W73-13693

CALIBRATION OF DISTRIBUTED PARAMETER GROUNDWATER FLOW MODELS VIEWED AS A MULTIPLE-OBJECTIVE DECISION PROCESS UNDER UNCERTAINTY,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
S. P. Neuman.
Water Resources Research, Vol 9, No 4, p 1006-1021, August 1973. 11 fig, 35 ref.

Descriptors: *Groundwater resources, *Flow, *Management, *Decision making, *Linear programming, *Aquifers, Finite element analysis, Optimization, Anisotropy, Systems analysis, Mathematical models, *Risks.
Identifiers: Multiple objectives, Sensitivity analysis.

Due to the deterministic nature of most groundwater flow models, there has been a tendency to overlook the strong element of uncertainty that invariably enters into the problem of parameter identification. Because of this uncertainty, an approach based on the minimization of a single error functional generally does not lead to satisfactory results. A multiple-objective decision process is postulated, accounting for all the available information on the aquifer flow system, as well as the range of environmental conditions under which the system is expected to operate in the future. According to this new approach, a continuous or discrete set of alternative solutions to the identification problem is generated with the aid of mathematical programming techniques, and the decision maker is asked to apply his own value judgment in selecting a particular model structure. The method is illustrated by applying parametric linear programming to a finite element model of steady state flow in a locally anisotropic aquifer. The reliability of each parameter estimate is ascertained using postoptimal sensitivity analysis. (Bell-Cornell)
W73-13699

ANALOG-MODEL STUDIES OF THE EFFECTS OF RECHARGE WELLS ALONG THE HOUSTON SHIP CHANNEL ON POTENTIOMETRIC SURFACES OF THE CHICOT AND EVANGELINE AQUIFERS, HOUSTON, TEXAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-13762

A FINITE-ELEMENT, PLANAR-FLOW MODEL OF CAMAS PRAIRIE, IDAHO,
Idaho Univ., Moscow. Dept. of Geology.
R. W. Wallace.
Ph D Dissertation, November 1972. 166 p, 8 fig, 4 plate, 35 ref, 5 append. OWRR A-018-IDA (6).

Descriptors: *Hydrogeology, *Finite element analysis, *Groundwater movement, *Mathematical models, *Alluvial channels, *Idaho, Alluvium, Water balance.
Identifiers: *Camas Prairie (Idaho).

A finite-element, planar-flow model was applied to groundwater movement in an intermontane valley in Camas and Elmore Counties, Idaho. The valley sides and surrounding areas are composed mainly of igneous and volcanic rocks that are relatively impermeable. The basement rock beneath the valley floor is assumed to be of the same material as the sides. The groundwater system consists of a shallow water table aquifer, a clay unit and two artesian aquifers separated by relatively impermeable silty clay. A finite-element mesh is developed corresponding to a geologic section parallel to the valley axis. The program computes head, potential, flow velocities in 2 directions normal to each other, resultant flow velocity and resultant flow direction with respect to the coordinate system, for each element in the mesh. (Knapp-USGS)
W73-13763

STATUS AND TRENDS IN HYDROLOGICAL FORECASTS: PART B, FORECASTING OF GROUND WATER, SOIL MOISTURE AND SEDIMENTATION.
For primary bibliographic entry see Field 02A.
W73-13770

CHEMICAL AND SPECTROCHEMICAL ANALYSES OF SELECTED GROUND WATER IN COLORADO,
Geological Survey, Lakewood, Colo.
E. C. Mallory, Jr., and P. R. Barnett.
Open-file report, June 1973. 47 p, 1 fig, 11 tab, 7 ref.

Descriptors: *Water analysis, *Chemical analysis, *Spectrometers, *Groundwater, *Colorado, Sampling, Data collections, Analytical techniques, Correlation analysis, Inorganic compounds, Nutrients, Trace elements, Water temperature, Geochemistry, Chemical reactions.

Chemical and spectrographic analyses are presented for 44 saline and 48 fresh samples of groundwater from wells and springs in Colorado. Thirty-two of the samples were from thermal springs. The samples were collected during 1967-69, many from the same sources sampled in 1911 and and 1912 in order to compare analytical data. Samples were collected and analyzed by the U. S. Geological Survey employing both conventional wet analytical and emission spectrographic techniques. Emission spectrographic analyses yielded determinations of elements not reported in the early studies, and modern instruments and methods in general make possible more accurate and sensitive chemical analyses. Comparison of 1967-69 with 191112 measurements of water temperature for selected spring water and groundwater showed little difference. Dissolved solids of 1967-69 water samples appeared to be slightly lower than those reported of 1911-12 samples, but this difference may be largely due to different methods of analysis. Some water contained arsenic, cadmium, iron, manganese, sulfate, chloride, and fluoride in concentrations that equalled or exceeded standards adopted by the U. S. Public Health Service for drinking water. (Woodard-USGS)
W73-14102

OPEN-FILE MAPS SHOWING ALTITUDES IN SHALLOW GRAVEL AQUIFERS IN MARCH 1973, IN COLUMBIA BASIN IRRIGATION PROJECT AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 07C.
W73-14108

GROUND WATER IN THE EUGENE-SPRINGFIELD AREA, SOUTHERN WILLAMETTE VALLEY, OREGON,
Geological Survey, Washington, D.C.
F. J. Frank.
Available from GPO, Washington, D.C. 20402, Price $2.75. Water-Supply Paper 2018, 1973. 65 p, 12 fig, 3 plate, 8 tab, 18 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water wells, *Oregon, Well data, Geology, Water yield, Water quality, Water utilization, Groundwater recharge, Chemical analysis, Water resources development, Water supply, Evaluation, Projections, Basic data collections, Hydrologic data, Maps.
Identifiers: *Eugene-Springfield area (Ore).

The cities of Eugene and Springfield (Oregon) and their outlying suburban and rural districts constitute an area of rapid population growth where progressively greater volumes of groundwater are being required for irrigation and industrial and public supplies. The area is also one of diverse geologic and hydrologic conditions. Storage capacity of the central lowland in the Eugene-Springfield area is estimated to be about 2.1 million acre-feet in the zone 10-150 feet below land surface. The quantity of groundwater available annually from this area is far greater than the 23,000 acre-feet pumped for all uses in 1968. Groundwater from the alluvial deposits of the valley plain is chemically suitable for irrigation and other uses, as is most of the water obtained from perched-water bodies i volcanic rocks. However, the mineral content of water from the older sedimentary rocks, particularly from deeper producing zones, is greater than the mineral content of water from the alluvial deposits. Locally, some of the water from the older rocks is too saline for most uses. Increased use of groundwater may result in certain problems pertaining to waste-disposal practices, local overdraft of aquifers, well interference, and well construction. (Woodard-USGS)
W73-14113

GROUND-WATER RESOURCES OF THE ASHUELOT RIVER BASIN, SOUTHWESTERN NEW HAMPSHIRE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14116

APPLICATION OF GEOMORPHOLOGY IN GROUNDWATER PROSPECTING IN THE ALLUVIAL PLAINS AROUND BURDWAN, WEST BENGAL,
India Institute of Tech., Kharagpur.
S. Mallick, and D. Niyogi.
Indian Geohydrology (Calcutta), Vol 8, No 2, p 86-98, December 1972. 7 fig, 10 ref.

Descriptors: *Hydrogeology, *Geomorphology, *Alluvial channels, Terraces (Geologic), Alluvium, Sands, Deltas, Exploration, Investigations, Aquifer characteristics.
Identifiers: *India (Bengal).

The Quaternary terrain around Burdwan, India shows two common and distinct types of landforms--deltaic plains and valley plains. On the basis of a detailed photogeomorphic map groundwater potential was predicted through geomorphpositions of buried channels, filled valley-cuts and substrata of formations are possible aquifers. Laterite uplands are generally low-potential zones. Terraces of the rivers are considered to be good-potential zones. A detailed photogeomorphic map is very helpful for locating the positions of the ancient buried channels within the terraces. (Knapp-USGS)
W73-14118

ROLE OF DEPTH AND QUALITY OF WATERTABLE ON SOIL SALINIZATION,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 02G.
W73-14122

THE MODERN SCOPE OF HYDROGEOLOGY,
Research Council of Alberta, Edmonton.
J. Toth.
Indian Geohydrology (Calcutta), Vol 8, No 1, p 23-41, June 1972. 2 fig, 40 ref.

Descriptors: *Hydrogeology, *Reviews, Education, Hydraulics, Forestry, Engineering, Water resources development, Exploration, Geology, Geomorphology.

Hydrogeology is the science of interaction between groundwater and the rock framework. This interaction is manifested in a wide range of processes and phenomena both underground and at the land surface. Knowledge and understanding are utilized to solve scientific and technical problems of several disciplines such as water resources development, civil engineering and environmental studies, agriculture and forestry, mining, exploration for minerals and hydrocarbons, general geology, and geomorphology. The hydrogeologic parameters and relevant material properties are determined with numerous and very different techniques and methods. The very broad and advanced type of education required for the modern hydrogeologist seems to present a problem to universities indeveloping suitable curricula. (Knapp-USGS)
W73-14123

THERMAL SPRINGS OF INDIA AND THEIR DEVELOPMENT,
Indian Association of Geohydrologists, Calcutta.
M. S. Balasundaram.
Indian Geohydrology (Calcutta), Vol 8, No 1, p 1-9, June 1972.

Descriptors: *Thermal springs, *Thermal water, Hot springs, Geothermal studies, Thermal power, Water temperature, Hydrogeology.
Identifiers: *India.

The thermal springs of India are classified into three categories: springs located in the stable shield areas unaffected by post-Paleozoic movements; those in the shield areas affected by Mesozoic vulcanicity and/or post-Gondwana tectonism; and springs in the post-Mesozoic mobile belts. In the Indian subcontinent, except for the fumaroles and thermal springs of Naraka Kundam Island, there are no active volcanic fields. However, fumarolic or solfataras fields occur in the form of a few mild geysers in the Himalayan region. The first group is characterized by relatively low temperature, 30-35C; the temperatures of those of the second group vary from 35-75C and those of the third group vary from 50-102C. A few have temperatures above the boiling point. (Knapp-USGS)
W73-14125

GROUNDWATER DISTRIBUTION, KARST, AND MUDFLOWS IN THE CARPATHIAN ZONE (ZAKONOMERNOSTI RASPREDELENIYA PODZEMNYKH VOD, KARST I SELI KARPATSKOY ZONY),
B. A. Korzhenevskiy, and B. Yu. Lyaskovskiy.
Geologicheskiy Zhurnal, Vol 33, No 3, p 157, May-June 1973.

Descriptors: *Conference, *Groundwater, *Karst, *Mudflows, Hydrogeology, Engineering geology, Water supply, Water types, Industrial wastes, Institutions, Planning.
Identifiers: USSR, *Ukraine, *Carpathians, Mineral resources.

An interdepartmental conference devoted to groundwater, karst, and mudflow studies in the Ukrainian Carpathians and attended by over 100 representatives from 20 organizations was held in L'vov, December 13-15, 1972. Conference papers focused on problems of regional hydrogeology, hydrogeology of mineral resources, subsurface drainage, and karst. Hydrogeologic and geologic-engineering projects planned for the region include investigations of domestic and industrial water supply, industrial wastes, and methods of mudflow and karst control. (Josefson-USGS)
W73-14143

GEOLOGY AND EARTH RESOURCES OF OKLAHOMA,
Geological Survey, Norma, Okla.
For primary bibliographic entry see Field 07C.
W73-14153

GEOLOGY OF MONROE COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-14158

COMPARISON OF STATISTICAL AND DETERMINISTIC APPROACHES IN THE DETERMINATION OF HYDROLOGICAL PARAMETERS OF AQUIFERS,
Bundesanstalt fuer Bodenforschung, Frankfurt am Main (West Germany).
H. J. Duerbaum, and K. Trippler.
In: Proceedings (Vol III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-

son, Dec. 11-14, 1972, p 1009-1028, (1972). 11 fig, 6 ref.

Descriptors: *Groundwater basins, *Parametric hydrology, *Hydrogeology, Hydraulics, *Statistical methods, Permeability, Transmissivity, Mathematical models, Systems analysis, Flow, Pumping.
Identifiers: Errors, W. Germany.

The procedure to evaluate and interpret hydrogeological, hydrological and hydraulic data for short and long term aquifer behavior must be more or less of a statistical nature. Only in very rare ideal cases does the observed data fit the theoretical behavior of a model in all details. Thus, only to a certain extent do analog and digital models allow checking the compatibility of the data. It depends somewhat on the scale under which the aquifer is being considered. The hydrological behavior of a more or less extended polygon is to be represented in the model by a few parameters which are constants or time-dependent in a comprehensible way. The relatively great distances between the nodes of the observation grid have a smoothing influence; to a certain extent the nonrepresentative character of the observation data and the hydrogeological inhomogeneities on the other side introduce larger errors in the difference approximations of the second order derivatives. These points are demonstrated with the aid of several examples where a large amount of data is avilable which has been treated in various ways. Estimates are given on the influence of the grid mesh, the recording sequence, and other variables which can be chosen in such investigations. (See also W73-14166) (Bell-Cornell)
W73-14171

2G. Water in Soils

LANDSLIDES AT BRECKENRIDGE, PINEVIEW GOLF CLUB, AND ROCKCLIFFE,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
For primary bibliographic entry see Field 02J.
W73-13670

AN EVALUATION OF SOIL WARMING FOR INCREASED CROP PRODUCTION,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-13710

CATENARY SOIL RELATIONSHIPS IN ISRAEL: II. THE BET GUVRIN CATENA ON CHALK AND NARI LIMESTONE CRUST IN THE SHEFELA,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
J. Dan, D. H. Yaalon, and H. Koyumdjisky.
Isr J Earth-Sci. Vol 21, No 2, p 99-114, 1972. Illus.
Identifiers: Bet guvrin catena, *Catenary soil relationships, Chalk, *Israel (Shefela), *Limestone crust, Morphology, Nari, Physical relationships, Soil.

The catena on the nari covered northern slope consists of grumusolic dark brown soil (Haplargids) on the flat hilltops, thick noncalcareous brown rendzina soil (Rendolls) on the moderate sloping uplands, typical brown rendzina on the steep slopes and brown rendzinic colluvial-alluvial soils (Haploxerolls) in narrow gullies. On soft chalk rock (southern slope) brown rendzina is replaced by pale rendzina and brown rendzinic colluvial-alluvial soils by highly calcareous colluvial-alluvial soil (Haplorthents). The origin of brown soils (brown rendzina and grumusolic dark brown soils) is attributed mainly to accumulation of aeolian dust, while the pale rendzina soils formed from the weathering of the underlying soft rocks. The leaching the decalcification stage depends mainly on soil depth, exposure and age. The shallow brown rendzinas are usually noncalcareous and the profile on the northern slope exhibits transformation of montmorillonite to kaolinite. The leaching stage of the grumusolic dark brown soil is typical of the semiarid regional climate. The soils are calcareous throughout with a typical calcic horizon at the modal depth of moisture penetration. The pale rendzinas are not leached due to their young age. Although shallow, the brown rendzinas are mature soils and cover stable slopes where the rate of erosion is slow. The pale rendzinas represent the typical mature soil of the area. The soils of gullies are young and immature, especially those encountered on chalky slopes.--Copyright 1973, Biological Abstracts, Inc.
W73-13720

INFILTRATION ANALYSIS AND ITS APPLICATION ON IRRIGATION DESIGN IN THE INFERIOR VALLEY OF COLORADO RIVER (IN SPANISH),
Universidad Nacional del Sur, Bahia Blanca (Argentina).
For primary bibliographic entry see Field 03F.
W73-13805

INFILTRATION CHARACTERISTICS OF FURROW IRRIGATION IN A HEAVY-TEXTURED SOIL,
Agricultural Univ., Wageningen (Netherlands). Afdeling Weg- en Waterbouwkunde.
For primary bibliographic entry see Field 03F.
W73-13811

PLANT-SOIL RELATIONS,
Universidad Nacional de Colombia, Palmira. Facultad de Agronomia.
For primary bibliographic entry see Field 03F.
W73-13812

REACTOR COOLING WATER FOR AGRO-INDUSTRIAL DEVELOPMENT,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 05D.
W73-13819

POLLUTION LOADS IN PERCOLATE WATER FROM SURFACE SPREAD SWINE WASTES,
Maryland Univ., College Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-13822

PERSISTENCE OF MANURE PHOSPHORUS AVAILABILITY IN CALCAREOUS SOIL,
Arizona Univ., Tuscon. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 05B.
W73-13823

A STUDY OF FOREST SOILS AND LEACHATES ON SLOPING TOPOGRAPHY USING A TENSION LYSIMETER,
Washington Univ., Seattle.
W. W. Bourgeois, and L. M. Lavkulich.
Can J Soil Sci. Vol 52, No 3, p 375-391. 1972. Illus.
Identifiers: *Forest soils, *Leachates, *Lysimeter (Tension), Mineralogical studies, Sloping soils, Topography, Ionic concentration.

Acrylic tension lysimeters were used to collect both vertically and horizontally moving water from soils at 2 different forest sites on sloping topography. The leachates were analyzed for ion content and the values compared within each soil, between soils, and relative to soil properties. The topographically lower site (Whatcom soil) had an accumulative leachate volume collected over the 4-mo. study period of 2387.4 l, whereas the upper slope soil (Blaney series) yielded only 901.2 l of leachate. Collected leachate volumes varied within each pedon as expressed by the Whatcom soil values of 22.8 l from the surface soil horizons increasing to 1184.0 l from the horizons immediately above the impervious glacial material. Downslope movement of water occurred throughout each pedon but to a greater extent in the subsurface horizons. Although more leachate was collected from the Whatcom soil, the ionic concentrations were similar between the 2 sites. Within the pedons the podzol B horizons had the highest ion concentrations. The general order of cation abundance was Na greater than or equal to Ca > K > Mg, which was explained by the mineralogical composition of the soils. The anions varied in their abundance but bicarbonate was generally the most abundant. Seasonal trends were indicated in both anion and cation leachate concentrations.--Copyright 1973, Biological Abstracts, Inc.
W73-13856

YIELD OF FLUE-CURED TOBACCO AND LEVELS OF SOIL OXYGEN IN LYSIMETERS WITH DIFFERENT WATER TABLE DEPTHS,
Agricultural Research Service, Florence, S.C. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03F.
W73-13908

INFILTRATION AND ANTECEDENT PRECIPITATION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
C. N. Papadakis, and H. C. Preul.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY8, Paper 9940, p 1235-1245, August 1973. 4 fig, 1 tab, 11 ref, append.

Descriptors: *Infiltration, *Antecedent precipitation, *Hortons law, Infiltration rates, Soil water movement, Infiltrometers.

A simple, inexpensive, and expedient method is presented for determining the initial infiltration capacity (fo), the decay rate of infiltration (k), and the constant infiltration capacity (fc) to be used in Horton's equation. The method consists of performing a series of infiltration tests using flooding-type test tube infiltrometers for different antecedent precipitation conditions. Horton's equation is fitted to the available data, thus obtaining values of fo, fc and k for each test. Daily rainfall records are used, starting at least 2 months prior to the infiltration tests, to determine the antecedent precipitation index values corresponding to each test. Curves of antecedent precipitation index plotted against Horton's constants provide the designer with the proper values of fo and K for the soil on which infiltration tests were performed for any specified antecedent condition. (Knapp-USGS)
W73-13965

SOIL PROPERTIES AND NUTRIENT AVAILABILITY IN TARWEED COMMUNITIES OF CENTRAL WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 02I.
W73-14000

ENERGY FIXATION AND PRECIPITATION--USE EFFICIENCY IN A FERTILIZED RANGELAND ECOSYSTEM OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 02I.
W73-14002

MICROFLORA OF SOIL AS VIEWED BY FREEZE-ETCHING,
Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-14071

ROLE OF DEPTH AND QUALITY OF WATERTABLE ON SOIL SALINIZATION,
Central Soil Salinity Research Inst., Karnal (India).
A. K. Bandyopadhya.
Indian Geohydrology (Calcutta), Vol 8, No 1, p 56-58, June 1972. 2 fig.

Descriptors: *Saline soils, *Water table, *Irrigation effects, *Drainage effects, Leaching, Chlorides, Soil chemical properties, Soil chemistry, Soil physical properties.
Identifiers: *Soil salinization.

Both heavy- and light-textured soils are salt affected. An experiment was undertaken to study the effect of soil texture on soil salinization keeping the depth and quality of water table constant. Sand was mixed with soil to get three different soil textures having 65%, 75% and 80% sand. Water table was maintained at 120 cm below the surface. Water contained 10 meq per liter each of sodium chloride, sodium sulfate and sodium carbonate. The soil having less sand percentages contains more salts throughout the profile than the other two soils. In all the three profiles, electric conductivity is near the water table. It then decreases in the profile and gradually increases towards the soil surface. Salt content is highest on the surface soil. The result of the experiment shows that the lighter the soil texture, the less it would be affected by salinity of the groundwater, and salt accumulation in the soil profiles would also be less. (Knapp-USGS)
W73-14122

WATER VAPOR CONDENSATION IN THICK LOW-HUMIC CHERNOZEMS ON THE LEFT BANK OF THE UKRAINIAN FOREST STEPPE (O KONDENSATSII VODYANYKH PAROV V MOSHCHNYKH MALOGUMUSNYKH CHERNOZEMAKH LEVOBEREZHNOY LESOSTEPI USSR),
I. G. Zakharchenko, and Yu. G. Beskrovnyy.
Pochvovedeniye, No 9, p 89-94, September 1972. 1 fig, 4 tab, 15 ref.

Descriptors: *Soil physics, *Water vapor, *Condensation, *Chernozems, *Grasslands, Forests, Atmosphere, Meteoric water, Soil moisture, Soil temperature, Thermocline, Seasonal, Instrumentation, Analytical techniques.
Identifiers: USSR, *Ukraine.

Water vapor condensation in soil was investigated in 1965-67 on thick, low-humic Chernozems of the Drabovskaya Experimental Station in the forest steppe of the Ukraine. Field investigations were conducted with condensation meters (metal boxes) 12.5 cm wide, 10 cm deep, and 20 cm long. The water supplied in summer to the root zone of soil by atmospheric vapor condensation is negligible, amounting to about 4-5 mm a year. Considerably more moisture accumulates in the upper 1.5 m of soil in winter as a result of vapor movement from lower soil layers. Winter condensation reaches 7-25 mm, depending on original soil moisture content. (Josefson-USGS)
W73-14147

DETERMINATION OF BENOMYL RESIDUES IN SOILS AND PLANT TISSUES BY HIGH-SPEED CATION EXCHANGE LIQUID CHROMATOGRAPHY,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Biochemicals Dept.
For primary bibliographic entry see Field 05A.
W73-14195

2H. Lakes

AN INVESTIGATION OF THE CAUSE AND EFFECT OF EUTROPHICATION IN LONG LAKE, WASHINGTON,
Eastern Washington State Coll. Cheney. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-13658

BIOLOGICAL IMPACT OF COMBINED METALLIC AND ORGANIC POLLUTION IN THE COEUR D'ALENE-SPOKANE RIVER DRAINAGE SYSTEM,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05B.
W73-13659

DISCHARGE OF SUSPENDED SEDIMENT IN THE LITTORAL ZONE OF THE KAKHOVKA RESERVOIR,
For primary bibliographic entry see Field 02J.
W73-13691

STUDY OF WIND-INDUCED TIDAL OSCILLATIONS OF SEA AND RESERVOIR SURFACES,
V. I. Vechorek.
Fluid Mechanics--Soviet Research, Vol 2, No 2, p 37-39, March-April 1973. 2 fig, 6 ref.

Descriptors: *Wind tides, *Water level fluctuations, *Sea level, *Reservoirs, *Surfaces, Wind velocity, Shear stress, Equations.
Identifiers: USSR.

Wind-tide oscillations of sea level caused by shear stresses are considered, and a relationship is obtained for computing magnitude of sea and reservoir surface oscillations. The formula proposed yields best results when compared with full-scale data for measured water levels resulting from wind speeds up to 15-17 m/sec. (Josefson-USGS)
W73-13692

SUBMERGED VEGETATION OF THE ROTORUA AND WAIKATO LAKES: I. 'CYCLIC CHANGE' IN LAKE ROTOITI,
Auckland Univ. (New Zealand). Dept. of Botany.
V. J. Chapman, B. T. Coffey, and J. M. A. Brown.
N Z J Mar Freshwater Res. Vol 5, No 3/4, p 461-496, 1971. Illus.
Identifiers: *Cyclic change (Vegetation), Elatine-spp, Elodea-canadensis, Glossostigma-spp, Lagarosiphon, Lakes, Lilaeopsis-lacustris, Myriophyllum-propinquum, *New Zealand (Rotoiti lake), *Submerged vegetation.

In Lake Rotoiti, North Island, New Zealand, 'cyclic change' apparently occurs among mounds of the 'Low Mixed Community' of plants; this is the first evidence of cyclic change in a wholly submerged community. The Low Mixed Community grows on gently sloping sandy substrates near the shores of bays sheltered from the prevailing SW winds, and usually extends to depths of about 1.8 m, where dense beds of Lagarosiphon major begin. Composition, distribution, growth and fate of mounds at various depths were analyzed. One species of 5 genera (namely Glossostigma spp., Elatine spp., Lilaeopsis lacustris, Elodea canadensis, and Myriophyllum propinquum) colonized bare sand and trapped more sand; as the mound grew, other species appeared. Mounds in deeper water (>0.9 m) were larger and floristically richer than those in shallower water, and were thus probably older. In calm conditions, mounds sometimes fused to form a polytypic sward. Typically, the backwash of waves eroded the shoreward ends and sides of mounds; the mounds thus became elongated parallel to the wind direction. Provided that their growth at the offshore end at least balanced erosion at their shoreward ends, some marked mounds tended to grow downslope into deeper, less often disturbed water. Although backwash started mound erosion down to 0.6 m depth, it could also erode bare areas in mounds (caused by die-off of plants, herbicide sprays, and mechanical damage) down to 1.2 m, the depth to which it normally influenced loose substrate. In exceptional easterly storms, backwash might influence plants at greater depths, and perhaps locally destroy the community so that the cycle would have to begin again. An invasion of Lagarosiphon over mound plants into depths of only 0.9 m, and for the 'Low Mixed Community' the appropriate name Glossostigmatum aquaticae is proposed because Glossostigma spp. predominated in all floristic analyses.--Copyright 1973, Biological Abstracts, Inc.
W73-13711

A CLASSIFICATION OF THE LAKES OF OREGON,
Oregon State Univ., Corvallis. Air and Water Resources Research Inst.
J. R. Donaldson, D. W. Larson, J. G. Malick, and R. C. Kavanaugh.
Available from the National Technical Information Service as PB-222 913, $3.00 in paper copy $1.45 in microfiche. Completion Report, June 1, 1973. 23 p, 5 fig, 16 ref. OWRR A-003-ORE (8).

Descriptors: Lakes, Classification, Limnology, Recreation, Oregon, *Hydrologic data, *Data collections, Computer programs, Thermal properties, Optical properties, Chemical properties, Biological properties.
Identifiers: *Oregon lakes, *Lake classification.

The overall objectives of the project were: to assemble information presently available concerning lakes of Oregon; to sample selected lakes in different geological areas and/or drainage basins in order to accumulate limnological data essentail for a state classification scheme; and to develop a system for recording, storage, and retrieval of lake data that would be available for general use. A list of Oregon lakes that were sampled has been compiled; it includes number of visits to each lake by year, type of information obtained on each sampling, and the computer programs used for data analysis.
W73-13717

INFECTION OF AMERICAN SMELT IN LAKE ONTARIO AND LAKE ERIE WITH THE MICROSPORIDIAN PARASITE GLUGEA HERTWIGI (WEISSENBERG),
Saskatchewan Fisheries Lab., Saskatoon.
For primary bibliographic entry see Field 05C.
W73-13718

THEORETICAL FOUNDATIONS FOR THE STUDY OF PRODUCTIVITY IN AZERBAIJANIAN LAKES AND RESERVOIRS,
For primary bibliographic entry see Field 05C.
W73-13728

EXPERIENCE IN THE STUDY OF BOTTOM ASSOCIATIONS IN THE DNIEPER RIVER RESERVOIRS AND THEIR PRODUCTIVITY,
For primary bibliographic entry see Field 05C.
W73-13729

SOME BIOLOGICAL PECULIARITIES IN RESERVOIRS IN SOUTH TURKMENIA,
For primary bibliographic entry see Field 05C.
W73-13730

A PRELIMINARY COMPARISON OF THE ZOOPLANKTON IN A TROPICAL AND A TEMPERATE LAKE (LAKE GEORGE, UGANDA AND LOCH LEVAN, SCOTLAND),
For primary bibliographic entry see Field 05C.
W73-13732

PLANKTON COMPOSITION IN RELATION TO NUTRIENT INFLOW IN A SMALL NEW ZEALAND LAKE,
For primary bibliographic entry see Field 05C.
W73-13733

CORRELATION BETWEEN DISSOLVED OXYGEN AND PHYTOPLANKTON IN THE LOWER REACHES OF VOLTA LAKE, GHANA,
For primary bibliographic entry see Field 05C.
W73-13735

REMOTE SENSING STUDY OF THERMAL DISCHARGES TO LAKE MICHIGAN, ILLINOIS--INDIANA-MICHIGAN.
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-13747

NEW PARASITE RECORDS FOR LAKE ERIE FISH,
Department of Lands and Forests, Maple (Ontario). Research Branch.
For primary bibliographic entry see Field 05C.
W73-13749

RADIOACTIVITY OF CASPIAN SEA SEDIMENTS AND THEIR DEPOSITION RATE (RADIOAKTIVNOST' I SKOROST' OBRAZOVANIYA OSADKOV KASPIYSKOGO MORYA),
For primary bibliographic entry see Field 02J.
W73-13752

SOME EFFECTS OF MYSID INTRODUCTION AND NUTRIENT ENRICHMENT ON A LARGE OLIGOTROPHIC LAKE AND ITS SALMONIDS,
For primary bibliographic entry see Field 05C.
W73-13776

BIOGENIC ENRICHMENT OF SOCKEYE SALMON LAKES AND STOCK PRODUCTIVITY,
Washington Univ., Seattle. Coll., of Fisheries.
For primary bibliographic entry see Field 05C.
W73-13777

HYDROBIOLOGICAL INVESTIGATION OF LAKE LERE AND NEARBY PONDS: III. CLADOCERA AND COPEPODA,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
R. Gras, and L. Saint-Jean.
Cah O R S T O M Ser Hydrobiol, Vol 5, No 2, p 175-178, 1971.
Identifiers: *Cladocera, *Copepoda, Hydrobiological studies, *Lake Lere (Chad), Ponds.

Hydrobiological investigation of Lake Lere and neighboring ponds revealed 24 spp. or varieties of Cladocera, 11 Copepoda (free forms), and 1 Decapoda. The Lake Lere population of planktonic crustaceans appears to be less diversified than that of Lake Chad; 3 spp. of copepods (Tropodiaptomus cf. laurenti Gauthier, 1951, Mesocyclops leuckarti (Claus, 1857), and Thermoclyclops neglectus (Sars, 1901)) and 3 spp. of cladocera (Moina micrura Kurz, 1874, Ceriodaphnia cornuta f. cornuta Sars, 1886 and rigaudi Richard, 1894, Diaphanosoma excisum Sars, 1886) were present as opposed to 4 and 8 main species (respectively) in Lake Chad. The Moina population was composed of parthenogenetic females of the typical form of M. micrura and forms with a variable number of teeth on the sides of the post-abdomen. At the time of the year when the samples were made, Rotifers were the dominant element of the zooplankton; the rarity of adult forms of copepods and cladocera was attributed to the heavy nocturnal predation of larvae of Chaoborus. Contrary to what is observed at Lake Chad, the free forms of parasitic copepods were very abundant in Lake Lere and nearby ponds. The crustacean fauna of these ponds was quite varied containing littoral and grass forms as well as planktonic ones; all were present in Lake Chad with the exception of 2 spp. As for the copepods, only 1 sp. was peculiar to the Lake Lere region. Most of the species identified have a wide range in Africa; the cladocera and cyclopid fauna of Lake Lere had the most common species with the Niger basin.--Copyright 1973, Biological Abstracts, Inc.
W73-13795

BIOLOGY OF THE CRUSTACEANS OF LAKE CHAD: II. DIET OF THE PLANKTONIC ENTOMOSTRACA,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort Lamy (Chad).
R. Gras, A. Iltis, and L. Saint-Jean.
Cah O R S T O M Ser Hydrobiol, Vol 5, No 3/4, p 285-296, 1971, Illus, English summary.
Identifiers: Anabaena, Biology, *Lake Chad, *Chad, *Crustaceans, Diets, *Entomostraca, Lakes, Mesocyclops-leuckarti, Plankton, Thermocyclops-incisus-circusi, Thermocyclops-neglectus, Thermodiaptomus-galebi, Tropodiaptomus-incognitus, Algae.

Planktonic Entomostraca of lake Chad ingest colonial and unicellular algae which size range from 4-30 micro. Tropodiaptomus incognitus and Thermocyclops neglectus ingest Anabaena, which is important in the lake. This ingestion probably depends on nutritional condition (behavior, abundance and form and size of Anabaena's chains...). Another diaptomid, Thermodiaptomus galebi, does not ingest this algae. Mesocyclops leuckarti and Thermocyclops incisus circusi are carnivorous species, and the third cyclopoid copepod, T. neglectus, has both carnivorous and herbivorous diet. The copepodid stages of M. leuckarti are herbivorous dominant at the first stages, and carnivorous dominant at stage C5. Diet is changing progressively. The copepodid stages of T. neglectus may be considered as herbivorous-detritivorous.--Copyright 1973, Biological Abstracts, Inc.
W73-13796

STUDY OF CERTAIN MERISTIC CHARACTERISTICS IN ALESTES BAREMOZE OF THE LOWER CHARI AND LAKE CHAD,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort Lamy (Chad).
J. R. Durand, and G. Loubens.
Cah O R S T O M Ser Hydrobiol, Vol 5, No 2, p 113-136, 1971, Illus, English summary.
Identifiers: *Alestes-baremoze, Lakes, *Meristic characteristics, *Lake Chad.

The average vertebra number (v average) is always about 1/3 higher among the females. There is no difference between sexes for the anal fin ray counts (r average). Assuming that meristic characters depend upon temperature, correlation with this factor is positive for (v average) and negative for (r average). Amplitude of distribution for and fin ray number and variability of this characteristic (up to 1 ray of variation between samples extremes) makes doubtful the existence of the Chadian subspecies which could be identified as the western subspecies. According to (r average) variations, 2 populations successively enter the river system: the first one, from April or May has, on an average, 23.7 branched anal fin rays; the other one, in July, has 24.1. These 2 populations come from the lake and make a spawning run; spawning areas are probably distinct, as they enter the system one after another. They are situated above the studied zone of the first population; for the second population they include at least Chari the river from Mailao to Fort-Lamy and Logone from Fort-Lamy to Ivie. The first population comes from east of the archipelago, in which a distinct part corresponds to fishes spawning in that region. The second population comes from the north (lake as a whole or archipelago only). When comparing with results obtained north of the lake, populations are distinguished. They differ by one or more of following characteristics: migration, number of branched and fin rays; place and time of spawning; length at first growth ring. The part of the lake used as a shelter is clearly shown: fishing, is almost solely done in the river system during A. baremoze spawning runs.--Copyright 1973, Biological Abstracts, Inc.
W73-13798

NUTRIENT INPUTS AND THEIR RELATIONSHIP TO ACCELERATED EUTROPHICATION IN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05C.
W73-13905

ORGANIC WASTES FOR ACID STRIP-MINE LAKE RECOVERY,
Missouri Univ., Columbia. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W73-13915

NEW CONCEPTS FOR MANAGING THE GREAT LAKES WATER RESOURCES,
Ohio Dept. of Natural Resources, Columbus.
For primary bibliographic entry see Field 06E.
W73-13935

A DISCUSSION OF PLANNING PROCEDURE IN TERMS OF THE OECD NINE BASIC WATER MANAGEMENT PROBLEMS,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06E.
W73-13936

COMPREHENSIVE PLANNING FOR THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06E.
W73-13937

INSTITUTIONAL ARRANGEMENTS FOR THE GREAT LAKES BASIN,
Pennsylvania Dept. of Forests and Waters, Harrisburg.
For primary bibliographic entry see Field 06E.
W73-13938

RESEARCH ACTIVITIES NEEDED FOR PLANNING AND MANAGEMENT IN THE GREAT LAKES,
Army Engineer Div. North Central , Chicago, Ill.
For primary bibliographic entry see Field 06E.
W73-13940

THE INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES: AN INTERNATIONAL, INTERAGENCY AND INTERDISCIPLINARY APPROACH TO A RESEARCH PROGRAMME IN WATER RESOURCES,
Meteorological Service of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 06E.
W73-13941

THE CANADA CENTRE FOR INLAND WATERS: AN APPROACH TO RESEARCH CO--ORDINATION,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.

For primary bibliographic entry see Field 06E.
W73-13942

METHANE IN LAKE KIVU: NEW DATA BEARING ON ITS ORIGIN,
Woods Hole Oceanographic Institution, Mass.
W. G. Deuser, E. T. Degens, G. R. Harvey, and M. Rubin.
Science, Vol 181, No 4094, p 51-54, July 6, 1973. 1 tab, 14 ref.

Descriptors: *Lakes, *Methane, *Carbon dioxide, *Water chemistry, *Africa, Chemical properties, Surface waters, Bacteria, Hydrogen, Limnology, Water properties, Microorganisms, Water types, Gases, Aquatic microorganisms, Deep water.
Identifiers: *Lake Kivu.

Lake Kivu, the most western and most elevated of a string of rift lakes curving through east-central Africa, has a peculiar hydrochemistry. Its deep waters (maximum depth nearly 500 m) contain up to 0.37 liter of methane and 1.4 liter of carbon dioxide (calculated at standard temperature and pressure) per liter of water. Data obtained on two recent expeditions suggest that most of the methane was formed by bacteria from abiogenetic carbon dioxide plus hydrogen, rather than by volcanic action or from decomposing organic matter. (Brown-IPC)
W73-14016

A PROBABILISTIC APPROACH TO THE DYNAMICS OF NATURAL POPULATIONS OF THE CHYDORIDAE (CLADOCERA, CRUSTACEA),
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. Keen.
Ecology, Vol 54, No 3, p 524-534, Late Spring, 1973. 7 fig, 30 ref.

Descriptors: *Animal populations, *Seasonal, *Dominant organisms, *Crustaceans, Sampling, Separation techniques, Biological communities, Reproduction, *Michigan, Community development, Fecundity, Invertebrates, Predation, Probability, Waterfleas.
Identifiers: Acroperus harpae, Graptoleberis testudinaria, Chydorus sphaericus, Camptocerus cf. rectirostris, Data interpretation, Cladocera, Macroinvertebrates, *Lawrence Lake (Mich.).

Populations of four chydorids in the littoral of Lawrence Lake, Michigan, were studied through an entire year. Samples were collected (at 2 to 7 day intervals) by lowering an inverted, 1-liter container to the proper depth and then letting it fill with water. Samples were transferred to beakers, allowed to settle, and gently heated to stimulate the chydorids to swim to the surface thereby separating themselves from debris. The water and animals were then decanted. Samples were concentrated with a net to about 10 ml and preserved with 95 percent ethanol. These were examined for counts of species and individual reproductive stages. Four species of chydorids dominated the samples: Acroperus harpae Baird, Graptoleberis testudinaria (Fischer), Chydorus sphaericus (O.F.M.), and Camptocerus cf. rectirostris Schodler. Through the entire year, these represented at least 75 percent, and usually more, of the chydorid numbers in each sample. Acroperus, Graptoleberis, and Camptocerus appeared in spring after a winter absence and reached maximum population in late summer or fall. Chydorus sphaericus peaked in spring and dropped to a low level in the summer, then rose through fall to a winter plateau. Predicted rates of birth were higher during summer when rates of observed change fluctuated considerably. A probabilistic method, based on reproductive potential, showed relatively large probabilities for changes observed from late fall to early spring in populations of Chydorus. Most population changes in the other three species, and in Chydorus during the summer, had zero probability. Most population loss appears to be predatory, emigation and 'natural' mortality are not important. (Little Battelle)
W73-14057

CHEMICAL RESPONSE OF UTAH LAKE TO NUTRIENT INFLOW,
Brigham Young Univ., Provo, Utah.
For primary bibliographic entry see Field 05C.
W73-14081

INFLOW, OUTFLOW, AND WATER QUALITY OF MISSION LAKE, NORTH-CENTRAL MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 05G.
W73-14100

PROBLEMS OF THE HYDROLOGY OF SEAS (VOPROSY GIDROLOGII MOREY).
See State Oceanographic Inst., Moscow (USSR).

Gosudarstvennyy Okeanograficheskiy Institut Trudy, No 115, Moscow, Goptarev, N. P., editor, 1972. 148 p.

Descriptors: *Hydrology, *Lakes, *Water balance, *Hydrologic cycle, Runoff, Water levels, Sea level, Salinity, Water quality, Water temperature, Sedimentation, Bottom sediments, Reservoirs, Estuaries, Deltas, Currents (Water), Surges, Littoral, Meteorology, Oceanography.
Identifiers: USSR, Caspian Sea, Sea of Azov, Baltic Sea.

Studies are made of changes in water balance of USSR seas under influence of human economic activity and changes in natural conditions, and problems relating to techniques of marine hydrological observations and computations are discussed. Individual papers deal with possible changes in water level and salinity of the Caspian Sea; predictive relations between hydrometeorological phenomena in the littoral zone and in open areas of the Baltic Sea; measurements of sea-surface temperature and determination of spatial discreteness of observations; water balance of closed and semiclosed seas; analysis of factors responsible for the catastrophic surge on the east coast of the Sea of Azov in October 1969; influence of hydrologic processes on spatial distribution of bottom sediments in water bodies of the Kuban' Delta; temporal discreteness of water-temperature observations in the littoral zone of seas; and methods of determining economic efficiency of oceanographic investigations. (Josefson-USGS)
W73-14145

A HYDROLOGIC DESCRIPTION OF LAKE MINNEHAHA AT CLERMONT, FLORIDA,
Geological Survey, Winter Park, Fla.
For primary bibliographic entry see Field 07C.
W73-14150

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A),
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 05C.
W73-14185

ECOLOGICAL CONCEPT OF THE COASTAL ZONE IN THE GREAT LAKES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05B.
W73-14193

2I. Water in Plants

THE EFFECTS OF WATER MANAGEMENT PRACTICES ON THE MOVEMENT OF LARGEMOUTH BASS,
Mississippi State Univ., State College. Water Resources Research Inst.
W. J. Lorio, R. L. Warden, Jr., and T. D. Thornhill.
Available from the National Technical Information Service as PB 222 904, $3.50 in paper copy, $1.45 in microfiche. July 1973. 46 p, 29 fig, 1 tab, 7 ref. OWRR A-066-MISS (1).

Descriptors: *Fish behavior, *Fish migration, *Water temperature, Fish habitats, *Bass, *Tagging, Tracking techniques, Seasonal.
Identifiers: *Ultrasonic tracking.

Ultra sonic tracking proved to be a successful method for studying the behavior of largemouth bass in relation to water manipulation and other environmental parameters. Several preferred locations were selected by bass released in the spring and fall as opposed to one location by bass released in the summer and winter. Movement and activity were greater during the spring and fall and could explain the selection of more than one location for a home area. Three of the sonic tagged bass returned to the point of original capture after orientation. Remaining bass all passed their capture site at least once during their migration to other areas. Water temperature was the only parameter that could be associated with increased or decreased movement. Temperatures ranging from 50-75 deg were associated with peak movement. Water manipulation affected the acreage of bass habitat available but resulted in neither increased nor decreased movement. Home range varied with the time of the year. A maximum range of 400 feet was exhibited by bass in March and September. These months were also associated with peak movement periods. Range varied during the remaining months from 100 feet in summer to 250 feet in spring and fall.
W73-13654

AQUATIC PLANTS FROM MINNESOTA PART 4 - NUTRIENT COMPOSITION,
Minnesota Univ., Minneapolis. Dept. of Animal Science.
J. G. Linn, R. D. Goodrich, J. C. Meiske, and E. J. Staba.
Available from the National Technical Information Service as PB-222 912, $3.50 in paper copy, $1.45 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 56. p 22, 9 tab, 26 ref, 1973. OWRR A-025-Minn (5).

Descriptors: *Aquatic plants, *Protein, *Fiber, *Nutrients, Forage, Carbohydrates, Minerals, *Minnesota, Chemical analysis, Biological properties.
Identifiers: *Ruminants, Proximate analyses, Digestibility, Palatability, Lipids, Van Soest Analysis.

Samples of 22 freshwater aquatic plants were analyzed to determine their potential feeding value for ruminants. Proximate analyses (mean plus or minus SD), on a dry matter basis were: crude protein, 12.7 plus or minus 4.4%; ether extract, 1.46 plus or minus 98%; crude fiber, 19.2 plus or minus 6.4%; ash, 2.05 plus or minus 1.24%; and NFE 64.6 plus or minus 6.5%. NDF, ADF, and ADL contents averaged 41.6 plus or minus 13.4%; 32.0 plus or minus 0.6% and 6.35 plus or minus 2.76%, respectively. Mineral contents (mean plus or minus SD) of the 22 aquatic plants were : P, 0.25 plus or minus 0.19%; Ca, 1.83 plus or minus 1.68%; K, 1.54 plus or minus 0.92%; Na, 0.30 plus or minus 0.25%; mg, 0.31 plus or minus 0.16%; Fe, 924 plus or minus 730 ppm; Zn, 80.6 plus or minus

96.6 ppm; Cu, 13.8 plus or minus 34.0 ppm; Mo, 19.7 plus or minus 9.7 ppm and Mn, 269 plus or minus 152 ppm. Van Soest's estimated apparent digestibility averaged 63.0 plus or minus 8.3%. (Walton-Minnesota)
W73-13716

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 1, FRESHWATER PLANARIANS TURBELLARIANS) OF NORTH AMERICA,
Smithsonian Institution Washington, D.C. Dept. of Invertebrate Zoology.
R. Kenk.
Copy available from GPO Sup Doc as EP1.16:18050 ELD 02/72, $2.50; microfiche from NTIS as PB-222 922, $1.45. Environmental Protection Agency, Water Pollution Control Research Series, February 1972, 81 p, 96 fig, 65 ref. EPA Project 18050 ELD 02/72.

Descriptors: *Aquatic fauna, Life cycles, Preservation, Distribution patterns, *North America.
Identifiers: *Identification manual, Illustrated key, *Freshwater planarians, *Triclads, *Turbellaria, Species list, Collection, Culture, Anatomy, Distinguishing characteristics, Ecological requirements.

A key is presented for the identification of the species of North American freshwater triclads or planarians known at present. Introductory chapters deal with the collecting, culturing, preservation, study, and general organisation and life cycle of planarians. The key is followed by a listing of the species and subspecies, giving their distinguishing characteristics, ecological requirements, and geographical ranges. Illustrations depict the external appearance and diagrams of the reproductive organs of the individual taxa. The principal literature for each species is indicated and listed in the appended bibliography of 65 items. An index of the generic and specific names and synonyms concludes the report. One new subspecies, Polycelis coronata brevipenis is established for L. H. Hyman's Polycelis coronata. (EPA)
W73-13736

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 2, THE GENUS ARGULUS (CRUSTACEA; BRANCHIURA) OF THE UNITED STATES,
Smithsonian Institution, Washington, D.C.
R. F. Cressey.
Copy available from GPO Sup Doc as EP1.16:18050 ELD 02/72, $2.50; microfiche from NTIS as PB-222 923 $1.45. EPA Report Water Pollution Control Research Series, February 1972. 14 p, 6 fig, 4 ref. EPA Project 18050 ELD 02/72.

Descriptors: *Aquatic fauna, United States, *Fish parasites, Distribution patterns.
Identifiers: Identification manual, Illustrated key, *Freshwater Branchiura, *Crustacea, *Argulus.

Twenty three species of Argulus are recognised as valid from the 37 reported from the United States. An illustrated key is provided to these species. Distribution and host records are also included. (EPA)
W73-13737

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO.3, FRESHWATER SPHAERIACEAN CLAMS (MOLLUSCA: PELECYPODA) OF NORTH AMERICA,
Michigan Univ., Ann Arbor. Museum of Zoology.
J. B. Burch.
Copy available from GPO Sup Doc as EP1.16: 13050 ELD 03/72, $2.50; microfiche from NTIS as PB-222 924, $1.45. EPA Report, Water Pollution Control Research Series, March 1972. 31 p, 34 fig, 14 ref. EPA Project 18050 ELD 03/73.

Descriptors: *Aquatic fauna, Freshwater, *Mollusks, *Pelecypods, *Clams, Preservation, Distribution patterns, North America.
Identifiers: *Identification Manual, Illustrated key, *Sphaeriacea, Species List.

Bivalved mollusks of the superfamily Sphaeriacea (Order Heterodonta) are represented in North America by 34 native and four apparently introduced species of the cosmopolitan freshwater Sphaeriidae and by one introduced species (Corbicula manilensis) of the Afro-Oriental family Corbiculidae. The North American Sphaeriidae include three genera: Sphaerium with 12 species, Pisidium with 25 species, and Eupera with one species. The genera Sphaerium and Pisidium are world-wide in distribution and occur in all North American states and provinces. Eupera is restricted to the Western Hemisphere: northern South America, Central America and the southern Coastal Plain of eastern North America. Although characters of soft anatomy are used in taxonomy of the Sphaeriacea, especially in the classification at the generic level and above, all taxa can be identified readily by characters of the shells, and such shell characters are particularly important in distinguishing the species. The main feature of this publication is an illustrated toxonomic key using shell characters for identification of the 39 species of North American Sphaeriacea. (EPA)
W73-13738

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 4, FRESHWATER POLYCHAETES (ANNELIDA) OF NORTH AMERICA,
Smithsonian Institution, Washington, D.C. Dept. of Invertebrate Zoology.
N. Foster.
Copy available from GPO Sup Doc as EP1.16:18050 ELD 03/72, $2.50; microfiche from NTIS as PB-222 925, $1.45. EPA Report, Water Pollution Control Research Series, March 1972. 15p, 5 fig, 10 ref. EPA Project 18050 ELD 03/72.

Descriptors: *Aquatic fauna, Freshwater, Preservation, Distribution patterns, North America.
Identifiers: *Identification Manual, Illustrated Key, *Freshwater polychaeta, *Annelida, Species list.

Eight species of freshwater polychaetes are reported in the form of a key. Three families are represented: Nereidae with six species; Sabellidae with one species; Serpulidae with one species. The key includes only those polychaetes actually collected from freshwater and not those reported to withstand low salinities under experimental laboratory situations. Collection and preservation methods are discussed as well as characters used in specific identification. (EPA)
W73-13739

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 5, THE FRESHWATER AMPHIPOD CRUSTACEANS (GAMMARIDAE) OF NORTH AMERICA,
Old Dominion Univ., Norfolk, Va.
J. R. Holsinger.
Copy available from GPO Sup Doc as EP1.16:18050 ELD 04/72 $2.75; microfiche from NTIS as PB-222 926, $1.45. EPA Report, Water Pollution Control Research Series, April 1972. 89 p, 32 fig, 67 ref. EPA Project 18050 ELD 04/72.

Descriptors: *Aquatic fauna, *Amphipoda, Preservation, Distribution patterns, North America.
Identifiers: *Identification Manual, Illustrated key, *Crustacea, *Gammaridae, Species list, Ecology.

The amphipod crustacean family Gammaridae is represented in the freshwaters of North America by eight genera and 81 described species; numerous other species are still undescribed. These eight genera, with the number of described North American freshwater species in parentheses, include: Gammarus (9), Crangonyx (18), Synurella (4),Apocrangonyx (6), Stygonectes (29), Stygobromus (10), Bactrurus (3), and Allocrangonyx (2). Ecologically, the freshwater gammarids are an important group of aquatic invertebrates, with species found in a variety of biotopes, including lakes, streams, ponds, swamps, springs, and subterranean waters.
W73-13740

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 6, AQUATIC DRYOPOID BEETLES (COLEOPTERA) OF THE UNITED STATES,
Oklahoma Univ., Norman. Dept. of Zoology.
H. P. Brown.
Copy Available from GPO Sup Doc as EP1.16:18050 ELD 04/72, $2.50; microfiche from NTIS as PB 222 927, $1.45. EPA Report, Water Pollution Control Research Series, April 1972. 82p, 198 fig, 45 ref. EPA Project 18050 ELD 04/72. 14-12-894.

Descriptors: *Aquatic fauna, *Insects, *Water beetles, United States, Preservation, Distribution patterns.
Identifiers: *Identification manual, Illustrated key, *Coleoptera, *Dryopoidea.

An illustrated key is given for all known species of adult dryopoid beetles of the United States which have aquatic stages and might be useful as indicators of water quality. A key is also given to the genera of larvae. For each species the known habitat and range are given. Life histories are briefly outlined and methods for collection, preservation, storage, and identification are suggested. Two new species, Optioservus ozarkensis Collier and Optioservus sandersoni Collier, are described. The genera included in the keys are: Chelonariidae--Chelonarium; Elmidae--Tribe Larini: Lara, Phanocerus; Tribe Elmini: Ampumixis, Ancyronyx, Atractelmis, Cleptelmis, Cylloepus, Dubiraphia, Elsianus, Gonielmis, Heterelmis, heterlimnius, Hexacylloepus, Macronychus, Microcylloepus, Narpus, Neocylloepus, Neoelmis, Optioservus, Ordobrevia, Oulimnius, Promoresia, Rhizelmis, Stenelmis, Zaitzevia; Dryopidae Dryops, Helichus, Pelonomus; Limnichidae--Limnichinae: Limnichus, Lutrochus, Physemus; Cephalobyrrhinae: Throscinus; Psephenidae--Eubriinae: Acneus, Dicranopselaphus, Ectopria; Eubrianacinae: Eubrianax; Psepheninae: Psephenus; Ptilodactylidae--Anchycteis, Anchytarsus, Stenocolus. The bibliography includes selected references in addition to the literature cited. (EPA)
W73-13741

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 7, FRESHWATER ISOPODS (ASELLIDAE) OF NORTH AMERICA,
Monash Univ., Clayton (Australia).
W. D. Williams.
Copy available from GPO Sup Doc as EP 1.16:18050 ELD 05/72, $2.50; microfiche from NTIS as PB-222 928, $1.45. EPA Report, Water Pollution Control Research Series, May 1972. 45 p, 36 fig, 3 tab, 27 ref. EPA Project 18050 ELD 05/72. 14-12-894.

Descriptors: *Aquatic fauna, *Isopods, Distribution patterns, Preservation, North America.
Identifiers: *Identification manual, Illustrated key, *Asellidae, Species list.

A key is given to the North American genera (Asellus and Lirceus) of asellid isopods. Another key is provided for the surface-living species of Asellus but lack of clear, published morphological distinctions in the genus Lirceus prevents the construction of a key for that genus. Notes on ecolo-

gy, collection, preservation and identification are also included. (EPA)
W73-13742

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 8, FRESHWATER LEECHES (ANNELIDA: HIRUDINEA) OF NORTH AMERICA,
Michigan Univ., Ann Arbor. Museum of Zoology.
D. J. Klemm.
Copy available from GPO Sup Doc as EP 1.16:18050 ELD 05/72, $2.50; microfiche from NTIS as PB-222 929, $1.45. EPA Report, Water Pollution Control Research Series, May 1972. 53 p, 28 fig, 60 ref. EPA Project 18050 ELD 05/72. 14-12-894.

Descriptors: *Aquatic fauna, *Annelida, Distribution patterns, Preservation, North America.
Identifiers: *Identification manual, Illustrated key, *Hirudinea, *Leeches, Species list.

An illustrated key to 63 species of North American freshwater leeches (Annelida:Hirudinea) is given with notes on their diagnostic features and distribution. (EPA)
W73-13743

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 9, CRAYFISHES (ASTACIDAE) OF NORTH AND MIDDLE AMERICA,
Smithsonian Institution, Washington, D.C.
H. H. Hobbs.
Copy available from GPO Sup Doc as EP 1.16:18050 ELD 05/72 $3.25; microfiche from NTIS as PB-222 930, $1.45. EPA Report, Water Pollution Control Research Series, May 1972. 173 p, 115 fig, 134 ref. EPA Project 18050 ELD 05/72. 14-12-894.

Descriptors: *Aquatic fauna, *Crustacea, *Crayfish, Distribution, Preservation patterns, North America.
Identifiers: *Identification manual, Illustrated key, *Decapoda, *Astacidae, Central America, Species list.

A brief introduction includes discussions of the systematic position of the 284 recognized species and subspecies of American crayfishes, their introductions into various regions of the United States and foreign lands, their habitats, methods of collecting and preservation, and problems of identification. Included in the series of illustrated keys that constitute the major part of the work are indications of the habitats and range of each crayfish. A list of selected references is followed by two appendices: one summarizing the distribution of each crayfish and the other consisting of a list of states and provinces with references to the crayfish that occur within them. An index to the taxa included constitutes the final section. (EPA)
W73-13744

THE FOREST-BOG COMPLEX OF SOUTHEAST ALASKA,
Alaska Univ., College. Dept. of Biological Sciences.
For primary bibliographic entry see Field 04A.
W73-13793

ELEMENTS OF ENERGY BALANCE IN GRASS CARP (CTENOPHARYNGODON IDELLA VAL.): III. ASSIMILABILITY OF PROTEINS, CARBOHYDRATES, AND LIPIDS BY FISH FED WITH PLANT AND ANIMAL FOOD,
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
Z. Fischer.
Pol Arch Hydrobiol, Vol 19, No 1, p 83-95, 1972.
Identifiers: Animal food, Carbohydrates, Ctenopharyngodon-idella, *Energy balance, *Fish food, Grass carp, Lipids, Plants, Proteins, *Carp.

Analysis was made of main organic compounds: proteins, carbohydrates and lipids consumed by grass carp in food, of the degree of their utilization and excretion. The fish were fed animal and plant food. Trials were made to balance these compounds. (See also W72-13815)--Copyright 1973, Biological Abstracts, Inc.
W73-13797

BIOLOGICAL STUDIES ON THE FRESHWATER SHRIMPS IN KOREA: III. THE FOOD AND GROWTH OF THE LARVAE OF PALAEMON MODESTUS,
Pusan Fisheries Coll. (Republic of Korea).
K-S. Chung.
Bull Korean Fish Soc, Vol 4, No 2, p 55-60, 1971, Illus, English summary.
Identifiers: Biological studies, Food, Growth, Hatching, *Korea, Larvae, Palaemon-modestus, *Shrimps (Freshwater).

Shrimps were collected from the Karak River and carried to the laboratory; hatched larvae were reared. The hatching period in the laboratory water tank was 8 hr (20 deg C approximately 20.9 deg C). The larvae died off from the 6th day after hatch without food. Feeding began on the third day after hatch. The relationship between density of food and consumption was not concerned when the number of Artemia nauplii was 2-6/ml of water. The relationship between the day (X) and the food (Y) is: $Y \pm 6.49824X1.18384$. The carapace growth curve is: $Y \pm 1.1608X0.10024$. The relationship between food (X) and body length (Y) is: $Y \pm 2.8114X0.12767$. The relationship between the carapace length and body length (Y) is: $Y \pm 3.7564X-0.4601$.--Copyright 1973, Biological Abstracts, Inc.
W73-13799

WATER AND PHOTOSYNTHESIS RELATIONS OF DESERT PLANTS IN THE MAURITANIAN SAHARA: II. ALTERNATING-GREEN, SWITCH-BRANCHED AND STEM-SUCCULENT TREES,
Technische Hochschule, Darmstadt (West Germany).
O. Stocker.
Flora (Jena), Vol 160, No 5, p 445-494, 1971, Illus, English summary.
Identifiers: *Desert plants (Trees), Adenium-honghel, Arid lands, Boscia-senegalensis, Calotropis-procera, Capparis-decidua, Climates, Deserts, Desiccation, Leptadenia-pyrotechnica, Morphology, Nitraria-retusa, *Photosynthesis, Relations, Salvadora-persica, Tamarix-senegalensis, Transpiration, Trees, *Sahara (Mauritanian).

The following species were investigated: Nitraria retusa, Tamarix senegalensis, Leptadenia pyrotechnica, Capparis decidua, Calotropis procera, Adenium honghel. They are types intermediate between the deciduous-raingreen (Acacia raddiana) and the true evergreen constitutions (Boscia senegalensis, Salvadora persica). The dilemma within the arid period, dry up or die of hunger, is solved either by the seasonable alternation of leaves, adapted to arid or rainy season by structure and quantity (Nitraria, Calotropis), or by evergreen switch-branches (Tamarix, Leptadenia, Capparis). In the stem-succulent, raingreen Adenium the green cortex is of decisive importance. In spite of the large differences within the morphological structures, all types show a noteworthy stability and quantity of the water and photosynthesis turn-over, which is made possibly by an accurate regulation of the transpiration.--Copyright 1973, Biological Abstracts, Inc.
W73-13801

A DOUBLE-WALLED PLANT CONTAINER OF PLASTIC WITH AUTOMATIC WATERING (IN GERMAN),
Landesanstalt fuer Immissions- und Bodennutzungsschutz des Landes Nordrheim-Westfalen, Essen (West Germany).
H. Van Haut, G. Scholl, and G. Van Haut.
Landwirtsch Forsch, Vol 25, No 1, p 42-47, 1972. Illus, English summary.
Identifiers: Automatic systems, *Plant containers, Plastic, Watering plants.

The rectangular container consists of a jacket vessel containing the water reserve and an inserted pot for growing the plants which is equipped with 2 ceramic cylinders. In response to the soil water potential, water is sucked in from the reserve through tubes by capillary effect. The ceramic cylinders, serviceable from outside, are installed at the upper part of the inner pot and keep the germination bed sufficiently moist. In centralizing the water supply, several vessels can be connected with each other in such a manner that soil washout and transport of nutrients from one vessel to another is avoided. The vessels are white outside and black inside to prevent the growth of algae.--Copyright 1973, Biological Abstracts, Inc.
W73-13803

CHANGE OF CARP HELMINTH FAUNA DUE TO SUMMERING IN STREAMS,
Zooveterynarnyi Instytut, Lvov (USSR).
V. M. Ivasik, I. M. Karpenko, and O. P. Kulakovskaya.
Helminthologia (Bratisl) 10 p 171-175 1969 (1971).
Identifiers: *Carp, Fauna, *Helminth fauna, Parasites, Streams, Summering.

The effect of summering in streams on helminthofauna of carp and carp hybrids was analyzed on the basis of results of parasitological discoveries by the usual methods. Fish (1000) of various ages and various categories (nonspawning, growing, fattening, and wintering) were studied from 1949-1966. Ponds after summering are stocked with healthy fish, which have passed through an antiparasitic bath. Species (14) of helminths were found, with varying patterns of invasion. Summering in streams facilitates reduction of contamination of fish by parasites, especially by helminths with a complex cycle of development. Fish productivity increased in all areas studied.--Copyright 1973, Biological Abstracts, Inc.
W73-13910

LARGER SEEDS OF WINTERFAT GERMINATE BETTER,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
H. W. Springfield.
Journal of Range Management, Vol 26, No 2, p 153-154, March 1973. 1 tab, 1 fig, 7 ref.

Descriptors: *Seeds, Size, *Germination, *Forages, *New Mexico, Shrubs, Plant growth, Vegetation establishment, Temperature, Lighting, Laboratory tests, Moisture, Environmental effects.
Identifiers: *Winterfat, Seedlings.

Usually larger seeds of a plant produce not only more vigorious seedlings than smaller seeds but often yield higher germination results also. In this study to determine the effects of size on germination, ripe fruits of winterfat were collected from plants near Corona, New Mexico, separated into 3 size classes, and germinated in the laboratory at four different temperatures under varying light and dark regimes. At all four temperatures total germination was higher and more rapid for large and medium seeds than for small seeds. Maximum germination of smaller seeds may be possible only when such external factors as moisture and temperature are optimum; therefore fewer seedlings may be produced in a field environment. (Gloyd-Arizona)
W73-13996

ROOTPLOWING AND SEEDING ARID RANGELANDS IN THE SOUTHWEST,
Agricultural Research Service, Las Cruces, N. Mex. Jornada Experimental Range.
For primary bibliographic entry see Field 03F.
W73-13998

EFFICIENCY OF WATER USE AND ASSOCIATED CHARACTERISTICS OF LEHMANN LOVEGRASS,
Agricultural Research Service, Tucson, Ariz. Plant Science Research Div.
For primary bibliographic entry see Field 04A.
W73-13999

SOIL PROPERTIES AND NUTRIENT AVAILABILITY IN TARWEED COMMUNITIES OF CENTRAL WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
A. R. Tiedemann.
Journal of Range Management, Vol 25, No 6, p 438-443, Nov. 1972. 2 fig, 2 tab, 19 ref.

Descriptors: *Nutrient requirements, *Soil physical properties, *Revegetation, *Frost heaving, Soil-water-plant relationships, *Washington, Grasses, Seeds, Infiltration rates, Heat flow, Heat transfer, Soil moisture, Plant groupings.
Identifiers: *Tarweed, Needlegrass.

Nutrient levels and nutrient availability of soils were evaluated by comparing certain soil physical properties between tarweed communities and adjacent stable, productive needlegrass communities. The vegetation pattern of abrupt breaks in the grassland vegetation resulting in a mosaic of barren areas, dominated by cluster tarweed, appears to have resulted from intensive frost action associated with a periglacial climate. Revegetation studies have shown that competition for moisture by cluster tarweed, and frost heaving of new grass seedlings prevent revegetation. An abrupt drop in soil surface between needlegrass and tarweed communities indicates that much of the topsoil is either missing or has never developed, correlating the possibility that soil nutrients are a limiting factor in the tarweed community. The effect of higher bulk density and lower organic matter content on the microenvironment of tarweed soils probably contribute to rapid heat exchange between soil and atmosphere, rapid heat transfer within the soil, reduced infiltration, and rapid drying of soil surface. (Bahre-Arizona)
W73-14000

NITROGEN AND PHOSPHORUS AVAILABILITY IN A FERTILIZED RANGELAND ECOSYSTEM OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, Mont.
A. L. Black, and J. R. Wight.
Journal of Range Management, Vol 25, No 6, p 456-460, Nov. 1972. 4 fig, 3 tab, 14 ref.

Descriptors: *Plant growth, *Nutrient requirements, *Fertilization, *Phosphorus, *Nitrogen, Ammonium compounds, Soil temperature, Soil water, Semiarid climates, Great Plains, *Montana, Ecosystems, Ranges.

The effect of high rate fertilization on plant growth and nutrient uptake was investigated on a native range site (Bouteloua-Carex- (Stipa) faciation of a mixed prairie association) near Sidney, Montana. Combinations of ammonium nitrate applied at rates of 0, 100, 300, and 900 lb/N/acre and concentrated superphosphate at rates of 0, 100, and 200 bl/P/acre increased total forage about 2.0-fold. Plants growing on the high N-P fertilizer plots began growth earlier and grew faster in the spring of both years than plants growing on unfertilized plots. High soil P levels reduce the sensitivity of plants to cool soil temperature, and N availability stimulates early plant growth. Timely nutrient availability is an extremely important growth aspect in relation to efficient plant utilization of stored soil water and growing season precipitation in a relatively cool, semiarid climate. Also included are data on the depth concentration of N and P in the soil layers and the variation within the 2-year study. (Bahre-Arizona)
W73-14001

ENERGY FIXATION AND PRECIPITATION--USE EFFICIENCY IN A FERTILIZED RANGELAND ECOSYSTEM OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, Mont.
J. R. Wight, and A. L. Black.
Journal of Range Management, Vol 25, No 5, p 376-380, Sept. 1972. 4 fig, 1 tab, 19 ref.

Descriptors: *Ecosystems, *Nutrient requirements, *Soil water, *Energy budget, Genetics, Nitrogen, Phosphorus, Great Plains, *Montana, Semiarid climates, Efficiencies, Ranges, Cycling nutrients, Genetics.

At least 3 factors play dominant roles in regulating energy-fixing capabilities of rangeland ecosystems: soil water availability, genetic potential of chlorophyll-bearing plants in the ecosystem, and nutrient availability. The latter seems to play a more important part than soil water availability. Plant nutrients, particularly N and P, play a vital role in the energy-fixing processes of rangeland ecosystems in the northern Great Plains. The ecosystems appear to be functioning at an energy level about one-third to one-half that obtainable when N and P availability is adequate. Nutrient cycling, which is directly influenced by climatic factors such as temperature and water, appears inadequate to supply nutrients at rates needed to maintain levels of production consistent with climatic conditions. (Bahre-Arizona)
W73-14002

STRESS METABOLISM. I: NITROGEN METABOLISM AND GROWTH IN THE BARLEY PLANT DURING WATER STRESS,
Waite Agricultural Research Inst., Glen Osmond (Australia).
For primary bibliographic entry see Field 03F.
W73-14004

COMPARATIVE STUDIES ON THE DEPENDENCE OF AQUATIC COLEOPTERA TO THEIR ENVIRONMENT IN THE AREA OF NEUSS,
K. Koch.
Decheniana, Vol 124, No 2, p 69-112, 1971, (1972), Illus, English summary.
Identifiers: Aquatic plants, *Beetles, *Coleoptera, Comparative studies, Dependence, Environment, *Germany (Neuss).

In the district of Neuss (Rhineland) the aquatic life of 8 different kinds of water were studied. The dependence of aquatic beetles upon water temperature and depth, upon the total hardness of the water and upon the plant-life in and about those waters was established. These factors, among others, have an influence on the species and upon the population density of the environment.--Copyright 1973, Biological Abstracts, Inc.
W73-14005

STUDIES OF THE HELMINTH FAUNA OF NORWAY: XX. SEASONAL CYCLES OF FISH PARASITES IN THE GLOMMA,
Zoologisk Museum, Oslo (Norway).
O. Halvorsen.
Norw J Zool, Vol 20, No 1, p 9-18, 1972, Illus.
Identifiers: Acanthocephala, Cestodes, *Fauna (Helminth), Fish, Nematode, *Norway (Glomma River), *Parasites (Fish), Reproduction, Rivers, Seasonal, Trematodes.

Parasite species (15) including cestodes, trematodes, acanthocephala and nematodes found on 5 fish species in the river Glomma, southeastern Norway, were investigated for seasonality in occurrence and reproduction. The reproductive cycles of the ectoparasites were very uniform with a peak in June. This shows that water temperature acts directly on these parasites and governs their maturation and egg production. The differences in occurrence noted among the ectoparasites are caused by difference in longevity and reproductive behavior of the parasite and seasonal variations in the ecology of the hosts. Also the seasonal cycles of the endoparasites may be understood on this background taking into account that seasonality in 1 or more intermediate hosts may modify the basic temperature dependent cycle. In only 1 case was it not possible to separate maturation and egg production in the parasite from the sexual cycle of the fish host.--Copyright 1973, Biological Abstracts, Inc.
W73-14007

THE ROTIFER FAUNA OF ROCK-POOLS IN THE TVARMINNE ARCHIPELAGO, SOUTHERN FINLAND.
Bergen Univ. (Norway). Zoological Museum.
B. G. Bjorklund.
Acta Zool Fenn. 135p 3-30. 1972, Illus.
Identifiers: Fauna, *Finland (Tvarminne archipelago), Records, Rock pools, *Rotifer fauna.

Altogether, 63 spp. were found in 68 samples from 50 pools, of which 16 are situated on 5 islands in the outer archipelago zone, and the remainder on 5 islands in the sea zone. The pools are classified into 6 types based mainly on their location, exposure, macrovegetation, bottom sediment, water color, size, and to a lesser degree on salinity and pH. The rotifer species characteristic of each type are indicated. An analysis of communities is made for the 22 most common species by use of a trellis diagram. Three main rotifer associations are found, corresponding quite well with the dominating species in 3 of the pool types. Taxonomic and ecological notes are provided for the poorly known or questionable species, and 21 spp. are shown in figures. Some rather similar Lepadella species are discussed on the basis of a biometric analysis. Eleven species are new to Finland.--Copyright 1973, Biological Abstracts, Inc.
W73-14011

VEGETATION OF THE HYDROGRAPHIC REGION OF THE MOORS ON THE VELKE DARSKO POND (BOHEMIAN-MORAVIAN HIGHLAND). (IN CZECH),
Ceskoslovenska Akademie Ved, Prague. Biologicky Ustav.
R. Neuhaeusl.
Folia Geobot Phytotaxon, Vol 7, No 2, p 105-165, 1972, Illus, English summary.
Identifiers: Carex-Chordorrhiza, Cereal, Communities, Crops, *Czechoslovakia Bohemian-Moravian highlands, Festuca-tenuifolia, Forests, Highlands, *Hydrographic region, Juncus-squarrosus, Meesia-triquetra, Minerals, Moors, Paludella-squarrosa, Pond, Scorpidium-scorpioides, Soils, Spruce, *Vegetation, Weeds.

The plant cover of a small territory in the central part of the Bohemian-Moravian Highlands (Czechoslovakia) is described. Subatlantic-montane species such as Juncus squarrosus and Festuca tenuifolia are characteristic, besides submontane forest species, peat-bog species and some relic blanket-bog species (Carex chordorrhiza, Scorpidium scorpioides, Paludella squarrosa, Meesia triquetra). The moderate xerothermic species only seldom penetrate on chalky soils up to the centrum of the territory. The vegetation is noted for many communities, however poor in species. Floating-leaved communities, reed and tall sedge communities, secondary stages of the ancient pools (rising after peat digging) and drainage channels, and

peat-bog meadows of the alliance Caricion canescenti-fuscae Nordh. are described. The semicultivated meadows formed by amelioration of peat-bog meadows were described as Carici-Festucetum rubrae ass. nova prov. The most frequent cultivated meadow of the mineral soils was identified with Trifolio-Festucetum rubrae Oberd. (alliance Arrhenatherion elatioris (Br.-Bl. 1925) W. Koch 1926). The pastures are represented by 2 clear cut associations (Nardo-Festucetum capillatae Klika et Smarda and Nardo-Juncetum squarrosi (Nordh.) Buker) and by an insufficiently known group of the Hygro- up to Xeronardeta. The dwarf shrub heaths grow on the drained and deforested parts of the peat-bogs, somewhat less on rough mineral soils. The natural spruce forests (Calamagrosti villosae-Piceetum F. K. Hart.) of the alliance Vaccinio-Piceion are bound with damp and cool terrain depressions in the investigated territory which is situated in the Fagion zone. They are spread secondarily on the dead, partly drained, margins of the peat-bogs. The cultural forests were divided on the basis of their correspondence to the natural potential vegetation. Two groups of field weed communities, corresponding to the eutrophic (on chalky soils) and oligotrophic (on silicate rocks) substrates were distinguished. Practically no differences have been found between weed communities of the cereal and intertilled crops.--Copyright 1973, Biological Abstracts, Inc.
W73-14096

PHYTOSOCIOLOGICAL STUDIES ON GREEN MEADOW VEGETATION OF TAMA RIVER NEAR TOKYO, WITH A COMPARATIVE STUDY OF THE VEGETATION OF THE TONE RIVER,
Yokohama Municipal Univ. (Japan).
A. Miyawaki, and S. Okuda.
Vegetatio, Vol 24, No 4-6, p 229-311, 1972, Illus.
Identifiers: Comparative studies, *Japan (Tama River), Meadows, *Phytosociological studies, Rivers, Soils, Succession, Tone, Vegetation.

Phytosociological study of the green meadows of the Tama river, Japan, revealed 19 new associations and 6 new alliances. Most frequently occurring associations are Phragmitetea (Oenantho-Phalaridetum arundinaceae, Miscanthetum sacchariflori, Caricetum dispalatae), Bidentetea (Panico-Bidention, Alopecurion amurensis), Plantaginetalis asiaticae (Agropyro kamoji-Rumicion japonicae), annual dwarf rush associations (Lindernion procumbentis) and Artemisietea princeps (Anaphalio-Artemision princeps). The association complexes of the meadows were produced by slight differences in conditions produced by the effects of water, by the intensity of erosion and accumulation and by the particle size of the deposited material. A close coincidence was observed between plant association and soil profile. Zonation of the plant associations is closely related to the water level and soil conditions. Succession of these associations is rarely completed because of the flooding and constant renewal of the soil. A theoretical succession process on the Tama River is presented. The vegetation units observed are ecologically comparable and vicarious with associations from similar locations in Europe. Vegetation maps are included.--Copyright 1973, Biological Abstracts, Inc.
W73-14097

VEGETATION MAP OF SOUTHERN PARTS OF SUBAREAS A AND C, BIG CYPRESS SWAMP, FLORIDA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14155

PHYTOSOCIOLOGICAL AND MYCOLOGICAL EXPLORATION OF THE RIXENSART HEATH AND THE LAND APPROACHING IT,
D. Thoen, and A. Bracke.
Nat Belg. Vol 52, No 5, p 225-244 1971. Illus.
Identifiers: Acid, Alder, *Belgium (Rixensart heath), Birches, Calluna, Destruction, Drosera-Rotundifolia, Exploration, Habitat, Heath, Land, Molina, *Mycological studies, *Phytosociological studies, Succession, Willows.

Reexamination of the Rixensart heath (Belgium) showed the botanical landscape to be in the midst of considerable evoution. The heath with Calluna shows a trend towards recolonization by the forest due to progressive abondoning of the practice of regular burning and grazing. The peat bog noted in 1941 has been colonized by the forest and is now in the form of a peaty thicket of willows, black alder, and birches. Observations on a stream of acidic water with Drosera rotundifolia indicated a certain stability of this grouping mainly due to frequent week-end trampling of the area by scouts. A basiclinal alder grove and meadows with high hygrophilous grasses are undergoing ruderalization and progressive filling because of dumping of earth and trash. Presently the abandoning of mowing is modifying the structure of the vegetation of meadows with Molinia. New villas and roads are also taking land and modifying the Rixensart heath.--Copyright 1973, Biological Abstracts, Inc.
W73-14181

CONTRIBUTION TO THE KNOWLEDGE OF THE FOREST ASSOCIATIONS OF THE LESSER CARPATHIANS, SLOVAKIA: 2. HABITAT CONDITIONS,
Ceskoslovenska Akademie Ved, Prague. Botanicky Ustav.
Z. Neuhaeuslova-Novotna.
Folia Geobot Phytotaxon, Vol 6, No 4, p 337-368, 1971, Illus, English summary.
Identifiers: Allium-ursinum, Beam, Carex-pilosa, *Czechoslovakia (Lesser Carpathians), Deschampsia-flexuosa, Dryopteris, *Forests, Genista, Habitat, Horn, Luzula-Spp, Oak, Primula, Sesleria-mercurialis, Soil types, *Ecological studies.

The ecological character of forest communities in the southern part of the Lesser Carpathians (Czechoslovakia) is discussed. The following communities were analyzed: a Carpathian oak-hornbeam forest Carici pilosae-Carpinetum with the moister Dryopteris subass., a typical subass., and the acidophilous Luzula albida subass., a secondary Primula oak-hornbeam forest on calcareous soils, originating from Cephalanthero-Fagetum or Carici-Carpinetum as may be demonstrated by soil types (brown rendzina-Cephalanthero-Fagetum, rendzina-braunerde-Carici pilosae-Carpinetum), an acidophilous subassociation of the mostly secondary, somewhat drier Festuco heterophyllae-Quercetum, an alluvial ash-alder forest Stellario-Alnetum in lower situated valleys with the moister Chrysosplenium subass. and Allium ursinum subass. on fresh soils, an alluvial forest Carici remotae-Fraxinetum on wet to swampy soils (nassgley), a Carpathian herbrich beech forest Dentario-Fagetum with the slightly oligotrophic Carex pilosa subass. and the very eutrophic Mercurialis subass., a calcareous beech forest Cephalanthero-Fagetum with the moister Circaea subass., a typical subass. and the very thermophilous Carex alba subass., a calcareous ravine forest Phyllitidi-Aceretum on shady slopes in submontane to montane regions, an acidophilous beech forest Luzulo-Quercetum with the slightly acidophilous Luzula subass. and the more oligotrophic Deschampsia flexuosa subass., xerophilous calcareous oak shrub forests of the Eu-Quercion pubescentis suballiance with the Sesleria xerophilous oak forest occurring on ridges and the more xerophilous Ceraso-Quercetum pubescentis on sunny slopes in the warmest regions, an acidophilous oak forest ofthe lower regions, Luzulo-Quercetum, with a typical subass. and the Genista subass.--Copyright 1973, Biological Abstracts, Inc.
W73-14192

DETERMINATION OF BENOMYL RESIDUES IN SOILS AND PLANT TISSUES BY HIGH-SPEED CATION EXCHANGE LIQUID CHROMATOGRAPHY,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Biochemicals Dept.
For primary bibliographic entry see Field 05A.
W73-14195

2J. Erosion and Sedimentation

LANDSLIDES AT BRECKENRIDGE, PINEVIEW GOLF CLUB, AND ROCKCLIFFE,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
R. J. Mitchell.
Available from National Research Council of Canada, Div of Building Research, Ottawa, Canada Price $0.50. Technical Paper No 322, September 1970. 19 p, 21 fig, 6 ref.

Descriptors: *Landslides, *Canada, *Clays, Soil strength, Mass wasting, Fissures (Geologic), Rheology, Rock mechanics, Soil mechanics.
Identifiers: *Ottawa (Ontario).

Landslides in the Ottawa area involve clay containing a system of small fissures. At low stress levels, the fissures give rise to dilatant behavior and predominantly frictional shearing resistance. Stability analyses based on these considerations result in reasonably good correlations between field measurements and strengths measured by soil testing procedures. (Knapp-USGS)
W73-13670

CALIFORNIA COAST NEARSHORE PROCESSES STUDY, ERTS-A EXPERIMENT NO. 088,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 02L.
W73-13681

BALANCE OF REDUCING PROCESSES IN SEDIMENTS OF THE PACIFIC OCEAN (BALANS REDUKTSIONNYKH PROTSESSOV V OSADKAKH TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
N. M. Strakhov.
Litologiya i Poleznyye Iskopayemyye, No 4, p 65-92, July-August 1972. 9 fig, 7 tab, 18 ref.

Descriptors: *Geochemistry, *Reduction (Chemical), *Sediments, *Pacific Ocean, Sea water, Sediment-water interfaces, Inorganic compounds, Sulfides, Organic matter, Profiles, Depth, Deep water, Maps.
Identifiers: USSR, Oozes.

A method of calculating the balance of reducing processes is proposed and applied to the profile made during the 46th voyage of the Soviet research vessel 'Vityaz' in 1969 and to the entire area of the Pacific Ocean. This profile, extending from Japan to the Hawaiian Islands, is about 2,000 km long and passes through volcanogenic-terrigenous deposits, hemipelagic deposits with inclusions of volcanogenic particles, and through red clays. Discussed are: (1) concept of the balance of reducing processes and methods of calculating and expressing it; (2) morphology of the reducing zone along the profile; (3) balance of reducing processes, and intensity of 'exchange of materials' between sediments and water; (4) general distribution of reducing processes and 'exchange of materials' in the Pacific; and (5) dynamics of reducing processes, and thickness of the active zone of sediments. (Josefson-USGS)
W73-13686

SULFUR IN SEDIMENTS OF THE PACIFIC OCEAN EAST OF JAPAN (SERA V TIKHOOKE-

ANSKIKH OSADKAKH K VOSTOKU OT YAPONII),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. I. Volkov, A. G. Rozanov, N. N. Zhabina, and T. A. Yagodinskaya.
Litologiya i Poleznyye Iskopayemyye, No 4, p 50-54, July-August 1972. 4 fig, 2 tab, 23 ref.

Descriptors: *Geochemistry, *Sulfur, *Sediments, *Pacific Ocean, Sulfates, Hydrogen sulfide, Pyrite, Organic matter, Chemical reactions, Reduction (Chemical), Oxidation, Mud, Littoral.
Identifiers: USSR, Thiosulfates, Hydrotroilite.

Recent sediments in the littoral zone of the Pacific Ocean east of Japan exhibit an unusually high content of free hydrogen sulfide. Hydrogen sulfide formed by bacterial reduction of sulfates in mud waters gives a number of derivatives, among which pyrite predominates. The content of other derivatives of hydrogen sulfide, sulfide, and free sulfur is not more than 0.01%, and the organic sulfur content is less than 0.1%. As a result of reduction, sulfate content may drop to 0.03%. The capacity of sulfate reduction, assessed from the sum of all reduced forms of sulfur and derivatives of hydrogen sulfide, is a function of the organic content of sediments. The capacity of sediments to accumulate free hydrogen sulfide depends on the content of reactive forms of iron. Spatial distribution of reduced forms of sulfur in sediments is examined. (Josefson-USGS)
W73-13687

PATTERNS OF CHANGE IN CHEMICAL COMPOSITION OF IRON-MANGANESE CONCRETIONS IN SEDIMENTS OF THE NORTHWESTERN PART OF THE PACIFIC OCEAN (ZAKONOMERNOSTI IZMENENIYA KHIMICHESKOGO SOSTAVA ZHELEZO-MARGANTSEVYKH KONKRETSIY V OSADKAKH SEVERO-Z APADNOY CHASTI TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
M. A. Glagoleva.
Litologiya i Poleznyye Iskopayemyye, No 4, p 40-49, July-August 1972. 4 fig, 5 tab, 21 ref.

Descriptors: *Geochemistry, *Iron, *Manganese, *Pacific Ocean, *Sediments, Clays, Mud, Metals, Trace elements, Chemical reactions, Deep water.
Identifiers: USSR, *Concretions, Vanadium, Zirconium, Tungsten.

Accumulation of iron-manganese concretions in sediments of the northwestern part of the Pacific Ocean was investigated during the 46th voyage of the Soviet research vessel 'Vityaz' along a traverse extending from the Tsugaru Strait to Wake Atoll. Intensification of the ore process in the direction of the pelagic region is expressed in an increase in ore material and a decrease in insoluble mineral residue of concretions in the area between the periphery and the center. Diagenetic redistribution of ore elements between enclosing muds and concretions, leading to enrichment of concretions, increases from the periphery towards the fine pelagic muds. With absolute enrichment in all ore elements except Cr, concretions are relatively enriched in Mn, Mo, Cu, Ni, Co, and W, and, correspondingly, deprived of Fe, Ti, V, and Zr between the periphery and the center. The factor determining the relationship between elements of the Fe and Mn groups in concretions is the ratio of the reactive forms of Fe and Mn in enclosing muds. (Josefson-USGS)
W73-13688

IRON AND MANGANESE FORMS IN SEDIMENTS OF THE NORTHWEST PACIFIC OCEAN (FORMY ZHELEZA I MARGANTSA V OSADKAKH SEVERO-ZAPADNOY CHASTI TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
A. G. Rozanov, V. S. Sokolov, and I. I. Volkov.
Litologiya i Poleznyye Iskopayemyye, No 4, p 26-39, July-August 1972. 4 fig, 2 tab, 29 ref.

Descriptors: *Geochemistry, *Pacific ocean, *Iron, *Manganese, *Sediments, Clays, Diagenesis, Chemical reactions, Oxidation, Reduction (Chemical), Littoral, Deep water, Depth.
Identifiers: USSR.

Distribution of iron and manganese in sediments in the northwestern part of the Pacific Ocean was investigated in geochemical surveying performed during the 46th voyage of the Soviet research vessel 'Vityaz'. The marked increase in total iron content with distance from the coast occurs without a marked increase in reactive iron content. The presence of interlayers of volcanic or coarsely fragmental terrigenous material sharply increases the iron content of sediments. The manganese content increases toward the pelagic region of the ocean, with an accompanying increase in the degree of oxidation of sediments. Three types of sediments, differing in their content of iron and manganese forms, are distinguished: reduced, oxidized (red clays), and transitional. Total iron content changes little with depth. The content of reactive iron increases in reduced sediments and decreases in oxidized sediments. The manganese content of red clays increases in the direction of lower horizons. (Josefson-USGS)
W73-13689

DISCHARGE OF SUSPENDED SEDIMENT IN THE LITTORAL ZONE OF THE KAKHOVKA RESERVOIR,
V. V. Khomitskii.
Fluid Mechanics--Soviet Research, Vol 2, No 2, p 40-43, March-April 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Sediment discharge, *Sediment transport, *Suspended solids, *Littoral drift, *Reservoirs, Shores, Waves (Water), Turbidity, Analytical techniques, Equations.
Identifiers: *Kakhovka Reservoir (USSR), Longshore currents.

Results are presented of full-scale observations of the flow rate of suspended solids in a section of the Kakhovka Reservoir. A formula is derived for calculating turbidity in the coastal zone. A relation proposed for computing littoral drift is accurate for the conditions under which observations were made. (Josefson-USGS)
W73-13691

INTERACTION AND THE SUSPENSION OF COARSE PARTICLES IN A HIGH-CONCENTRATION FLOW,
For primary bibliographic entry see Field 08B.
W73-13695

RADIOACTIVITY OF CASPIAN SEA SEDIMENTS AND THEIR DEPOSITION RATE (RADIOAKTIVNOST' I SKOROST' OBRAZOVANIYA OSADKOV KASPIYSKOGO MORYA),
V. K. Pokidin, Yu. V. Kuznetsov, E. A. Prozorovich, and F. A. Asadullayeva.
Geokhimiya, No 7, p 834-843, July 1972. 7 fig, 2 tab, 21 ref.

Descriptors: *Geochemistry, *Sediments, *Deposition (Sediments), *Sedimentation rates, *Radioactivity, Radioisotopes, Uranium radioisotopes, Radium radioisotopes, Radiochemical analysis, Chemical precipitation, Oxidation-reduction potential, Calcium carbonate, Sea water, Deep water, Shallow water, Cores, Curves.
Identifiers: USSR, *Caspian Sea, Thorium, Ionium.

Deposition rates of deep-sea and shallow-water sediments in the Caspian Sea were determined by the radium-ionium age method from data on vertical distribution of Ra-226, Th-230 (ionium), Th-232, and U-238 in II sediment cores taken from different parts of the sea. Sedimentation rates for deep-sea and shallow-water sediments are 6.0-26.0 cm and 100 cm per 1,000 years, respectively. Vertical distribution curves for Th-230 and Th-232 in deep-sea deposits differ, strengthening the view that the two isotopes enter pelagic deposits in different forms. Authigenic precipitation of ionium plays an important role in its accumulation on the sea floor in deep-sea areas. There is a close correlation between distribution of Th-230 and calcium carbonate in deep-sea sediments, indicating that sorption of ionium on finely dispersed suspensions is a principal mechanism of its precipitation from sea water. (Josefson-USGS)
W73-13752

IRON SULFIDE CONCRETIONS IN BOTTOM SEDIMENTS OF LAKE BAYKAL (KONKRETSII SUL'FIDOV ZHELEZA V DONNYKH OSADKAKH BAYKALA),
Limnologicheskii Institut, Irkutsk (USSR).
G. S. Goldyrev.
Akademiya Nauk SSSR Doklady, Vol 202, No 6, p 1404-1406, 1972. 1 fig, 14 ref.

Descriptors: *Mineralogy, *Lake sediments, *Bottom sediments, *Iron, *Sulfides, Pyrite, Metals, Size.
Identifiers: USSR, *Lake Baykal, *Concretions, Pyrrhotite.

Iron sulfide concretions in Holocene sediments of Lake Baykal range in size from minute microglobules to spherical and other forms with a diameter of 5 mm or more. Flaky concretions often have an area of as much as 25 sq cm and a thickness of 2 mm. Microspheroids also vary in size from 0.005 mm to 0.08 mm in diameter. Spectral analysis of concretions reveals traces of cobalt, nickel, barium, and manganese in amounts ranging from 0.06% to 0.07%. There is a direct relationship between magnetism of concretions and their pyrrhotite content. (Josefson-USGS)
W73-13753

BORON IN THE CLAY FRACTION OF BOTTOM SEDIMENTS IN THE SEA OF AZOV (BOR V GLINISTOY FRAKTSII DONNYKH OTLOZHENIY AZOVSKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopaemykh.
For primary bibliographic entry see Field 02K.
W73-13755

AMINO ACIDS IN ORGANIC MATTER FROM SUSPENSIONS, WATER, SEDIMENTS, AND PORE SOLUTIONS IN THE BLACK SEA (AMINOKISLOTNYY SOSTAV ORGANICHESKOGO VESHCHESTVA VZVESI, VODY, OSADKOV I GRUNTOVYKH RASTVOROV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05B.
W73-13756

SOIL EROSION AND TRANSPORT OF SOLIDS BY STREAMS, (EROSION DU SOL ET TRANSPORTS SOLIDES DES COURS D'EAU).
For primary bibliographic entry see Field 02A.
W73-13768

MODEL TEST OF BOX INLET DROP SPILLWAY AND STILLING BASIN PROPOSED FOR TILLATOBA CREEK, TALLAHATCHIE COUNTY, MISS.,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 08B.

W73-13781

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE SURFACE REAERATION OF UNIFORM STREAMS,
Mississippi Univ. School of Engineering.
C. V. Alonso, J. R. McHenry, and J-C. S. Hong.
Available from the National Technical Information Service as PB-223 011, $3.50 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, July 1973. 50 p, 15 fig, 2 tab, 35 ref, append. OWRR A-062-MISS (1).

Descriptors: Open channels, *Reaeration, *Sediments, *Diffusion, Aeration, *Suspended solids, *Turbulent flow, Laboratory tests, Mixing, Turbulence.

The surface reaeration of uniform streams, with and without sediments in suspension, has been studied in the laboratory. Based on the promise that the reaeration rate is controlled by an effective vertical diffusivity at the free surface and by turbulent mixing beneath it, an equation was developed to predict the reaeration rate of uniform clear water flows. The laboratory data gave support to the developed equation. This equation was then modified in order to account for the effect of suspended sediments on the surface reaeration of uniform sediment-laden streams. The new equation was substantiated by the experimental results, which indicate that the reaeration rate decreases as the average sediment concentration increases. The decrease was attributed to the dynamic influence of the suspended particles on the turbulent flow field.
W73-13817

DETERMINATION OF KENNEDY'S PARAMETER FOR DUNES,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
M. S. Yalin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY8, p 1287-1290, August 1973. 2 fig, 2 ref, append.

Descriptors: *Sand waves, *Dunes, *Sediment transport, Equations, Froude number, Channel morphology, Ripple marks.

The dimensionless wave number, a function of the flow depth and the sand wavelength is a function of the Froude number and of a dimensionless quantity, j, which is expected to reflect the influence of the real fluid conditions. A method is given for the evaluation of j when the sand waves are dunes and the flow is sufficiently tranquil. Knowledge of j for antidunes is not as important as for dunes. (Knapp-USGS)
W73-13961

RELATIONS AMONG RADIONUCLIDE CONTENT AND PHYSICAL, CHEMICAL, AND MINERAL CHARACTERISTICS OF COLUMBIA RIVER SEDIMENTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-14114

GROUNDWATER DISTRIBUTION, KARST, AND MUDFLOWS IN THE CARPATHIAN ZONE (ZAKONOMERNOSTI RASPREDELENIYA PODZEMNYKH VOD, KARST I SELI KARPATSKOY ZONY),
For primary bibliographic entry see Field 02F.
W73-14143

2K. Chemical Processes

HEAT AND WATER VAPOR EXCHANGE BETWEEN WATER SURFACE AND ATMOSPHERE,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D
W73-13663

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-13675

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1969-SEPTEMBER 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02L.
W73-13679

BALANCE OF REDUCING PROCESSES IN SEDIMENTS OF THE PACIFIC OCEAN (BALANS REDUKTSIONNYKH PROTSESSOV V OSADKAKH TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 02J.
W73-13686

SULFUR IN SEDIMENTS OF THE PACIFIC OCEAN EAST OF JAPAN (SERA V TIKHOOKEANSKIKH OSADKAKH K VOSTOKU OT YAPONII),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-13687

PATTERNS OF CHANGE IN CHEMICAL COMPOSITION OF IRON-MANGANESE CONCRETIONS IN SEDIMENTS OF THE NORTHWESTERN PART OF THE PACIFIC OCEAN (ZAKONOMERNOSTI IZMENENIYA KHIMICHESKOGO SOSTAVA ZHELEZO-MARGANTSEVYKH KONKRETSIY V OSADKAKH SEVERO-Z APADNOY CHASTI TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-13688

IRON AND MANGANESE FORMS IN SEDIMENTS OF THE NORTHWEST PACIFIC OCEAN (FORMY ZHELEZA I MARGANTSA V OSADKAKH SEVERO-ZAPADNOY CHASTI TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-13689

ESTIMATE OF THE CONTENT OF SPRAY DROPS IN THE NEAR-WATER LAYER OF THE ATMOSPHERE,
For primary bibliographic entry see Field 02B.
W73-13690

VERTICAL DISTRIBUTION OF DISSOLVED TRACE ELEMENTS IN BLACK SEA WATER (O VERTIKAL'NOM RASPREDELENII MIKROELEMENTOV, RASTVORENNYKH V VODE CHERNOGO MORYA),
For primary bibliographic entry see Field 05B.
W73-13754

BORON IN THE CLAY FRACTION OF BOTTOM SEDIMENTS IN THE SEA OF AZOV (BOR V GLINISTOY FRAKTSII DONNYKH OTLOZHENIY AZOVSKOGO MORYA),
Akademiya Nauk SSSR Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopaemykh.
I. A. Aleksina
Akademiya Nauk SSSR Doklady, Vol 204, No 3, 700-703, 1972. 1 fig, 1 tab, 26 ref.

Descriptors: *Geochemistry, *Boron, *Bottom sediments, *Clays, Illite, Sedimentary basin (Geologic), Salinity, Saline water, Inflow, Maps. Identifiers: USSR, *Sea of Azov, Black Sea, Kerch' Strait.

Boron in bottom sediments of the Sea of Azov was investigated for its relationship to basin salinity. The boron content of sediments clearly varies with the rate of inflow of waters from the Black Sea and with the erosion of terrigenous material. The boron content of new Euxinian sediments in the northern part of the sea varies between 0.007% and 0.01% and reaches 0.012% in the southern part. Relatively high boron concentrations occur in new Azov sediments in the middle part of the basin, while highest boron concentrations are found in sediments of the Kerch Strait through which waters from the Black Sea flow. (Josefson-USGS)
W73-13755

AMINO ACIDS IN ORGANIC MATTER FROM SUSPENSIONS, WATER, SEDIMENTS, AND PORE SOLUTIONS IN THE BLACK SEA (AMINOKISLOTNYY SOSTAV ORGANICHESKOGO VESHCHESTVA VZVESI, VODY, OSADKOV I GRUNTOVYKH RASTVOROV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05B.
W73-13756

HANDBOOK FOR ANALYTICAL QUALITY CONTROL IN WATER AND WASTE WATER LABORATORIES.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-13790

AUTOMATION IN WATER PROTECTION AGAINST POLLUTION,
Polskie Towarzystwo Przyrodnikow im. Kopernika, Warsaw.
For primary bibliographic entry see Field 05A.
W73-13807

A STUDY OF FOREST SOILS AND LEACHATES ON SLOPING TOPOGRAPHY USING A TENSION LYSIMETER,
Washington Univ., Seattle.
For primary bibliographic entry see Field 02G.
W73-13856

SOLUBILITY AND OCCURRENCE OF LEAD IN SURFACE WATER,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W73-13960

NATURAL CHEMICAL QUALITY OF WATER RIVERS (MAJOR IONS)--A LITTERATURE REVIEW (QUALITE CHIMIQUE NATURELLE DE L'EAU DES RIVIERES (IONS MAJEURS)--REVUE DE LITTERATURE),
National Inst. of Scientific Research, Quebec.
M. Meybeck.
INRS-Eau Technical Report No 10, September 1972. 40 p, 31 ref.

Descriptors: *Water quality, *Ion transport, Water chemistry, Groundwater, Water budget, Hydrogram, *Reviews.

This literature review deals with papers mainly published since 1964. It is divided in 4 parts: empirical approaches: conductivity-concentration connections, longitudinal variations, variations with discharge, seasonal and annual cycles; theory of natural quality variations and quality models; use of water quality studies to separate the hydrogram components; and calculation of the dissolved matter input and statistical studies. (INRS-Eau)
W73-13988

AUTOMATED SOLVENT EXTRACTION FOR THE DETERMINATION OF TRACE METALS IN WATER BY AAS (ATOMIC ABSORPTION SPECTROPHOTOMETRY),
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 05A.
W73-14047

INFLUENCE OF ABSORPTION COEFFICIENT ON REFLECTANCE OF WATER,
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 05A.
W73-14082

CHEMICAL AND SPECTROCHEMICAL ANALYSES OF SELECTED GROUND WATER IN COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02F.
W73-14102

GROUND WATER IN THE EUGENE-SPRINGFIELD AREA, SOUTHERN WILLAMETTE VALLEY, OREGON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-14113

GROUND-WATER RESOURCES OF THE ASHUELOT RIVER BASIN, SOUTHWESTERN NEW HAMPSHIRE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14116

STUDY OF THE QUALITY OF FORMATION WATERS FROM ELECTRIC LOGS IN THE SALT AREA, CALCUTTA,
Central Groundwater Board, Calcutta (India).
S. Das.
Indian Geohydrology (Calcutta), Vol 8, No 2, p 99-103, December 1972. 2 fig, 1 tab.

Descriptors: *Water quality, *Borehole geophysics, *Electrical well logging, Resistivity, Salinity, Bicarbonates, Chlorides.
Identifiers: *India (Calcutta).

Electric logs were recorded in the exploratory boreholes drilled in the Salt Lake area, Calcutta, India, to evaluate the quality of formation water in the deeper aquifers and its suitability for domestic uses in the proposed township around the Salt Lake. Salinity as determined by chemical analysis varies from 1200 to 1600 ppm, and compares well with the values determined from resistivity of formation waters. Since the groundwater in the area is chloride-bicarbonate type, the actual values of total dissolved solids were intermediate between those computed from electric logs for sodium chloride and bicarbonate types of water. (Knapp-USGS)
W73-14117

GEOCHEMISTRY OF THE GANGA RIVER WATER,
Geological Survey of India, Calcutta.
B. K. Handa.
Indian Geohydrology (Calcutta), Vol 8, No 2, p 71-78, December 1972. 8 tab, 5 ref.

Descriptors: *Water chemistry, *Rivers, *Dissolved solids, Bicarbonates, Carbonates, Calcium, Alkaline earth metals, Magnesium, Geochemistry.
Identifiers: *India, *Ganga River.

Ganga river water (India) is of the alkaline earth bicarbonate type. However, near Calcutta, the influx of tidal water changes its character radically. The total dissolved mineral content of the river water gradually increases with distance from the source up to Varanasi; but thereafter it tends to decrease. The nature and concentration of the dissolved mineral content also varies in different seasons. During the monsoons the total dissolved minerals are not only lower but the alkaline earths and the bicarbonate ions are also more predominant. On the average the Ganga River carries annually around 90 million tons of various ions to the sea, of which nearly 79 million tons are the alkaline earth bicarbonates. (Knapp-USGS)
W73-14120

GEOLOGY AND EARTH RESOURCES OF OKLAHOMA,
Geological Survey, Norma, Okla.
For primary bibliographic entry see Field 07C.
W73-14153

WATER RESOURCES OF THE UPPER WABASH RIVER BASIN, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14157

SURFACE-WATER AVAILABILITY, FRANKLIN COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-14159

RECONNAISSANCE OF THE WATER RESOURCES OF THE TULSA QUADRANGLE, NORTHEASTERN OKLAHOMA,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 07C.
W73-14160

MAJOR INORGANICS,
Alabama Univ., University.
For primary bibliographic entry see Field 05A.
W73-14189

A PROBE FOR SAMPLING MIRE WATERS FOR CHEMICAL AND GAS ANALYSIS,
Nottingham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-14198

ANTICATALYTIC MICRODETERMINATION OF MERCURY USING CERIUM-ARSENITE REACTION,
Windsor Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-14200

2L. Estuaries

STRUCTURAL AND STRATIGRAPHIC FRAMEWORK, AND SPATIAL DISTRIBUTION OF PERMEABILITY OF THE ATLANTIC COASTAL PLAIN, NORTH CAROLINA TO NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-13666

DEPOSITIONAL BEHAVIOR OF COHESIVE SEDIMENTS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
A. J. Mehta, and E. Partheniades.
Available from NTIS, Springfield, Va 22151 as PB-218 854, Price $3.00 printed copy; $1.45 microfiche. Technical Report No 16, March 1973. 275 p, 103 fig, 51 ref. NSF Grant GK-31259.

Descriptors: *Sediment transport, *Inland waterways, *Erosion control, *Sediment control, Channels, Sedimentation, Estuaries, Salinity, Flocculation.

The need to control erosion and deposition in waterways prompted this investigation of the fundamental laws governing transport of fine cohesive sediment. Shoaling is particularly a problem in estuaries where high salinity results in the settling of flocculated sediments. Experiments were conducted using a special testing apparatus free of secondary currents. A law describing the rates of deposition has been derived. This law gives the deposited fraction of the depositable portion of the sediment as a logarithmic-normal function of time. Using a sediment continuity principle, it was further shown that the apparent settling velocities of the flocs also depend on the same parameters. Data on the deposition of sediments from the San Francisco Bay estuary indicates a good agreement with the results derived from measurements in the testing apparatus. (Woodard-USGS)
W73-13669

SEDIMENT TRANSPORT IN A TIDAL INLET,
Geological Survey, Menlo Park, Calif.
J. R. Ritter.
In: Proceedings of 13th Coastal Engineering Conference, July 10-14, 1972, Vancouver, B C, Canada: American Society of Civil Engineers, New York, N Y, p 823-842, 1972. 6 fig, 3 tab, 7 ref.

Descriptors: *Sediment transport, *Sedimentation, *Lagoons, *Coasts, *California, Sands Tidal effects, Inlets (Waterways), Pacific Ocean, Discharge (Water), Flow rates, Tides, Particle size, Sediment yield.
Identifiers: *Bolinas Lagoon (Calif).

Five series of measurements of the quantity of sediment being transported by tides into and out of Bolinas Lagoon, Calif., were made as part of a study to determine the rate of sediment depostion in the lagoon and to define the sources and movement of the sediment. Three series of measurements were made at the inlet, and two series of measurements were made in two channels inside the lagoon not far from the inlet. In all, the suspended-sediment discharge for seven ebbtides and six floodtides was determined. The measurements were made during periods when inflow to the lagoon from upland sources was negligible; therefore, the values of sediment discharge represent those caused chiefly by tidal action. The highest flows and suspended-sediment discharges occurred during the major daily ebbtide. Most transported sediment was sand. Computations from a relation of suspended-sediment discharge and tidal range indicated that the annual suspended-sediment discharge of ebbtides exceeded that of floodtides by 9,000 tons. The highest concentration of suspended sediment occurred near the east shore of the inlet which is at the end of a sand spit. (Woodard-USGS)
W73-13671

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1969-SEPTEMBER 1970,
Geological Survey, Austin, Tex.
D. C. Hahl, and K. W. Ratzlaff.
Texas Water Development Board Report 171, June 1973. 123 p, 13 fig, 65 tab, 7 ref.

Descriptors: *Water quality, *Chemical analysis, *Estuaries, *Texas, Physical properties, Sampling, Data collections, Analytical techniques, On-site investigations, Laboratory tests, Dissolved oxygen, Specific conductivity, Water temperature, Hydrogen ion concentration, Turbidity, Biochemical oxygen demand, Chemical oxygen demand, Insecticides, Herbicides, Inorganic compounds, Nutrients.

In September 1967 the U.S. Geological Survey, in cooperation with the Texas Water Development Board, began a water-resources investigation of the principal estuaries along the Texas coast. This report presents data collected during the 1970 water year and is the third in an annual series of basic-data reports. Approximately 300 data collection sites were visited. About 55% of these sites are located adjacent to or between navigation aids, bridge piers, power poles, survey platforms, well structures, or landmarks and can be reoccupied exactly. At each data collection site, field data are collected from several points along a vertical. Samples for laboratory analyses are collected from a predetermined number of data-collection sites and at other sites in the network when significant changes in field data indicate a need for additional samples. Properties of constituents measured in the field are dissolved oxygen, specific conductance, temperature, pH, and transparency by Secchi disk. Laboratory analyses include the principal inorganic ions, biochemical oxygen demand (BOD), chemical oxygen demand (COD), insecticides and herbicides, ammonia, nitrite, nitrate, orthophosphate and total phosphate, and several other selected ions such as bromide, iodide, strontium, lithium, boron, and iron. (Woodard-USGS)
W73-13679

CALIFORNIA COAST NEARSHORE PROCESSES STUDY, ERTS-A EXPERIMENT NO. 088,
Army Engineer District, San Francisco, Calif.
D. M. Pirie, and D. D. Steller.
Available from NTIS, Springfield, Va., 22151 as E73-10375 Price $4.00 printed copy; $1.45 microfiche. National Aeronautics and Space Administration Contract Report CR-131016, March 1973. 32 p, 17 fig, 5 ref.

Descriptors: *Sediment transport, *Coasts, *Estuaries, *Remote sensing, *California, Aerial photography, Satellites (Artificial), Photography, Sediment discharge, Photogrammetry, Ocean currents, Tidal effects.
Identifiers: San Francisco area, Monterey Bay, Santa Barbara Channel, Los Angeles area, Earth Resources Programs.

Techniques used for enhancing and analyzing nearshore processes from ERTS-A and aircraft data are described. Four California nearshore sites are used as test cells including the San Francisco area, Monterey Bay, Santa Barbara Channel, and the Los Angeles area. Techniques used for analyzing the test cells were direct photographic processing, computer compatible tape gain change enhancement, discrete point density analysis and plotting, and densitometer enhancement. By using these methods, it is possible to measure the seaward extent of the suspended sediment transport and to differentiate sediment levels within the individual sediment lobes. The movement of riverine discharged suspensates and coastal sediments by currents was an intricate part of the sediment transport analysis. The larger estuaries in the test cell areas were also studied for flushing characteristics. (Woodard-USGS)
W73-13681

MAPS SHOWING AREAS OF POTENTIAL INUNCATION BY TSUNAMIS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W73-13682

INVENTORY AND EVALUATION OF INFORMATION ON DELAWARE BAY, VOLUME 3,
Delaware Univ., Newark. Coll. of Marine Studies.
D. F. Polis.
Available from NTIS, Springfield, Va 22151 as COM-73-10521 Price $3.00 printed copy; $1.45 microfiche. Sea Grant Publication, November 1972. 170 p.

Descriptors: *Hydrogeology, *Delaware River, *Bays, *Bibliographies, *Documentation, Information retrieval, Estuaries, Water resources, Water yield, Water quality, Ecosystems, Ecology, Water pollution sources, Pollution abatement, Tidal effects, Saline water intrusion, Environmental effects, Fish, Wildlife, Recreation, Economics, Social aspects.

This annotated bibliography of 583 documents is presented as an inventory of information on Delaware Bay. The bibliography is listed alphabetically by author and is divided into Delaware State and U.S. Government documents. A key word index is included. (Woodard-USGS)
W73-13697

TSUNAMI WAVES (VOLNY TSUNAMI).
Sakhalin Kompleksnyi Nauchno-Issledovatelskii Institute, Yuzhno-Sakhalinsk (USSR).

Sakhalinskiy Kompleksnyy Nauchno-Issledovatel'skiy Institut Trudy, No 29, Yuzhno-Sakhalinsk, Solov'yev, S. L., editor, 1972. 320 p.

Descriptors: *Tsunamis, *Waves (Water), *Ocean waves, *Earthquakes, *Seismic studies, Seismographs, Seismic waves, Travel time, Warning systems, Forecasting, Probability, Bathymetry, Acoustics, Mapping, Instrumentation, Measurement, Model studies, Mathematics, Equations, Curves.
Identifiers: USSR, Epicenters, Marigraphs, Marigrams.

Problems relating to tsunami origin and propagation and to improvements in tsunami warning systems are discussed in this collection of 23 papers published by the Sakhalin Scientific Research Institute in Yuzhno-Sakhalinsk. Investigations are made of earthquake and tsunami recurrence in the Pacific Ocean, tsunami activity in the Black Sea, Sea of Japan, and Kurile Islands, and factors influencing intensity of tsunami waves and runup heights reached by tsunamis. (Josefson-USGS)
W73-13751

THE FLUCTUATIONS IN COASTAL HYGROPHILOUS VEGETATION OF THE SOUTH CENTRAL PORTION OF THE BAY OF AUDIERNE,
Rennes Univ. (France). Faculte des Sciences.
J. Levasseur.
Bot Rhedonica Ser A. 10. p 251-292, 1971, Illus.
Identifiers: Agropyron-pungens, *Bay of Audierne, Coasts, Fluctuations, *France, *Hygrophilous vegetation, Juncus-maritimus, Phragmites-communis, Salinity, Schoenus-nigricans, Scirpus-pungens, Sensitivity.

Accidental modifications in the moisture and salinity conditions of a group of beach-side marshes determined a reorganization of the hygrophilous vegetation characterized by a qualitative loss in the flora and a reduction in the number of pre-existing elementary associations. Some of the very diverse reactions to modifications of the physical environment included weak competitive capacities of Scirpus pungens in relation to those of Scirpus maritimus, a sensitivity of Schoenus nigricans to medium and high salinities and great possibilities of extension of Juncus maritimus. Agropyron pungens and Phragmites communis.--Copyright 1973, Biological Abstracts, Inc.
W73-13808

FIRST REPORT ON A LEVEL PEAT BOG OF EASTERN TRENTINO (FIAVE), (IN ITALIAN),
Padua Univ. (Italy). Istituto di Biologia Anim.
G. Marcuzzi, G. Lorenzoni, and G. D. Doss.
Studi Trentini Sci Nat Sez B Biol, Vol 48, No 1, p 124-159, 1971, Illus.
Identifiers: Abies, Alnus, Alps, Betula, Bogs, Corylus, Fagus, Hypnaceae, Insects, *Italy, Oak, *Peat bogs, Phragmites, Physicochemical studies, Picea, Pinus, Plankton, Pollen, Salix, Sphagnum, Trophic states.

The Fiave bog occupies an ancient lake bed which was probably connected at one time with the glacial streams of the Lomaso basin. It covers about 0.5 km2, with its major axis running N to S. Soundings showed peat at a depth of 2.5 and 3.4 m containing sphagnum, Phragmites, Hypnaceae wood and gyttja; pollen analysis showed low levels of Salix, Betula, and Fagus, and somewhat higher levels of Alnus, Abies, Pinus, Picea, Corylus and mixed oaks. Every month of 1 yr the pH, O2 content and temperature of the water were checked and collections of flora and fauna were made from deep water, peripheral or littoral areas, superficial gyttja, deep peat, and the surrounding meadows. Many species of plankton, insects, flowering plants, and other types are listed. The bog in general is decidely oligotrophic, especially when compared to the Lagabrun bog in Val de Cembra, which is definitely eutrophic. Much more work needs to be done on the bogs of the Italian Alps, comparing physical and biotic factors and the relationship between them.--Copyright 1973, Biological Abstracts, Inc.
W73-13809

EFFECT OF WASTE DISCHARGES INTO A SILT-LADEN ESTUARY, A CASE STUDY OF COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-13815

SURVEY OF ESTUARINE SITE DEVELOPMENT LAGOON HOMEOWNERS, OCEAN COUNTY, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Resources.
For primary bibliographic entry see Field 06B.
W73-13818

THE DIMENSIONS OF COASTAL ZONE MANAGEMENT.
For primary bibliographic entry see Field 06E.
W73-13858

THE WETLANDS STATUTES: REGULATION OR TAKING,
For primary bibliographic entry see Field 05G.
W73-13859

A BILL TO BE ENTITLED AN ACT DEFINING AND RELATING TO THE MANAGEMENT AND PROTECTION OF INLAND AND COASTAL WETLANDS.
For primary bibliographic entry see Field 06E.
W73-13874

COMPUTER STUDIES OF ESTUARY WATER QUALITY,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-13907

THE ROLE OF ORGANIC DEBRIS AND ASSOCIATED MICROORGANISMS IN PELAGIC ESTUARINE FOOD CHAINS,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 05C.
W73-13980

EFFECT OF RIVER OUTFLOW MANAGEMENT ON MARINE LIFE,
Fourah Bay Coll., Freetown (Sierra Leone). Inst. of Marine Biology and Oceanography.
A. A. Aleem.
Mar Biol (Berl). Vol 15, No 3, p 200-208. 1972, Illus.
Identifiers: Eel, *Egypt (Nile delta), *Fisheries, Management, Mugils, Outflow, Rivers, Sardinella, Shrimp, Marine life, *Aswan High Dam.

Construction of the Aswan High Dam in Egypt, and subsequent cessation (since 1965) of surplus Nile Flood water (ca 35 billion m3 of water annually) from discharging into the Mediterranean Sea, has had an impact on marine life in coastal waters adjoining the Nile Delta and on brackish-water life in the lakes. Nutrient concentrations have fallen considerably in these waters; phytoplankton blooms associated with the Nile Flood have disappeared and, consequently, Sardinella catches have dropped from ca 15,000 tons in 1964 to 4600 tons in 1965 and to 554 tons in 1966. Depletion of nutrients, reduction of organic matter and of mud and silt deposition, affect also benthic life on the Continental Shelf and in brackish-water lakes adjoining the sea. Lake fisheries have also suffered from reduction in potential area and obstruction of free connection with the sea, thus hindering spawning migrations of mugils, shrimp and eel. Marine erosion, of the Delta Coast has speeded-up following the Dam construction, due to loss of mud and loss of Lake-Sea currents. This can result in transgression of the sea on these lakes, and calls for urgent measures for shore protection. The benefits of the Dam to Egypt and Sudan in terms of agricultural expansion, hydroelectric power generated, industrialization and rehabilitation of populations are apparent.–Copyright 1973, Biological Abstracts, Inc.
W73-14018

A STUDY OF NUTRIENT VARIATIONS IN THE SURFACE AND MIXED LAYER OF MONTEREY BAY USING AUTOMATIC ANALYSIS TECHNIQUES,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05B.
W73-14090

A CHECKLIST OF THE FISHES OF THE MONTEREY BAY AREA INCLUDING ELKHORN SLOUGH, THE SAN LORENZO, PAJARO AND SALINAS RIVERS,
Moss Landing Marine Labs., Calif.
G. E. Kukowski.
Available from NTIS, Springfield, Va. 22151 as COM-72-11127 - Price $3.00 printed copy; $1.45 microfiche. Moss Landing Marine Laboratories Technical Publication 72-2, 1972. 69 p, 2 fig, 11 tab, 195 ref. NOAA Sea Grant 2-35137.

Descriptors: *Fish, *Fish establishment, *Census, *Bays, *California, Rivers, Marine fish, Estuaries, Reviews, Bibliographies, Publications.
Identifiers: *Monterey Bay area (Calif), *Fish species, Sloughs.

Lists or tables identify the fishes of the Monterey Bay area. One table presents all the species reported in the bay area including the river and slough areas. Other tables identify fishes not yet reported in Monterey Bay but whose ranges include the area; fishes reported and literature sources; fishes reported from Elkhorn Slough, from the San Lorenzo River, from the Pajaro River, and from the Salinas River. (Woodard-USGS)
W73-14101

OVERWINTERING PINK SHRIMP, PENAEUS DUORARUM, IN CORE AND PAMLICO SOUNDS, N.C.,
North Carolina Div. of Commercial and Sports Fisheries, Raleigh.
C. E. Purvis, and E. G. McCoy.
Available from NTIS, Springfield, Va. 22151 as COM-72-11069. Special Scientific Report No 22, April 1972. 29 p, 9 fig, 7 tab, 14 ref. NOAA Fed Aid Project 2-129-R.

Descriptors: *Pink shrimp, *Migration, *Growth stages, *Sounds, *North Carolina, Tagging, Marking techniques, Surveys, Data collections, Commercial shellfish, Cold resistance, Water temperature, Seasonal, Fish management.
Identifiers: *Pamlico Sound (NC), *Core Sound (NC).

Population dynamics information is presented for pink shrimp in the Pamlico-Core Sound areas of North Carolina. Pink shrimp (Penaeus duorarum) were marked with biological stains and fluorescent pigments and released. A total of 9,510 pink shrimp was released from September to November; 4,774 in Core Sound and 4,736 in Pamlico Sound. Of these, 947 (20%) were retrieved from Core Sound and 534 (11%) from Pamlico Sound. The modes of length-frequency distribution curves remained constant at 85-95 mm total length for Core Sound and at 95-105 mm total length in Pamlico Sound. The result from these mark-recapture experiments strongly indicate that migration of pink shrimp from Pamlico Sound to the ocean, from Pamlico Sound to Core Sound, and from Core Sound to the ocean does not occur in the fall to any appreciable degree. Mass migration, as well as significant growth, is brought to a halt by cooler water temperatures in the fall. Migration and growth resume in the spring when stimulated by rising water temperatures. Total mortality estimates reveal that the mean total reduction per week was 27.0% for the fall of 1970 and 29.5% for the spring of 1971 overwintering survivors. (Woodard-USGS)
W73-14104

STUDIES OF TIDAL EFFECTS ON THE RIVER ZUARI, GOA,
Geological Survey of India, Calcutta.
For primary bibliographic entry see Field 02E.
W73-14119

PROBLEMS OF THE HYDROLOGY OF SEAS (VOPROSY GIDROLOGII MOREY).
See State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 02H.
W73-14145

TRANSPORT AND DEPOSITION OF SEDIMENTS IN ESTUARIES,
Geological Survey, Woods Hole, Mass.
R. H. Meade.
Geological Society of America, Memoir 133, p 91-120, 1972. 12 fig, 1 tab, 75 ref.

Descriptors: *Sediment transport, *Sedimentation, *Sediment distribution, *Estuaries, Particle size, Suspended solids, Tidal effects, Salinity, Flocculation, Density stratification, Reviews, Evaluation.
Identifiers: Shoaling.

The dynamic processes involved in the circulation of estuarine waters are probably the most important influences on the transport and deposition of sediments in estuaries. In moderately stratified or vertically homogeneous estuaries such as the Savannah (Georgia) and Thames (England) Rivers, sediments are moved progressively landward along the bottom and they accumulate near the limit of net landward flow. In highly stratified estuaries such as Southwest Pass of the Mississippi River, coarse sediments are trapped near the toe of the salt wedge while fine sediments are carried seaward over the salt wedge with the outflowing river water. On the basis of present information, however, distinctions cannot always be made between the results of natural dynamic processes and the results that are induced by the activities of man. Other possible influences on estuarine sedimentation are the inorganic and organic processes that tend to aggregate sedimentary particles, and the properties of the particles themselves. The effects of salt flocculation have been amply demonstrated by laboratory experiments, but no field evidence is available to show their importance in complex natural estuaries. The agglomeration of sediments by organisms likewise has been investigated in the laboratory, but its importance in nature needs to be evaluated. Knowledge of the composition and size distribution of the sediment particles contributed to estuaries from different sources is seriously deficient. (Woodard-USGS)
W73-14149

SOFT-SHELL CLAM POPULATION STUDY IN HAMPTON SEABROOK HARBOR, NEW HAMPSHIRE,
New Hampshire Fish and Game Dept. Concord.
W. C. Ayer.
Available from NTIS, Springfield, Va 22151 as COM-72-11180, Price $3.00 printed copy; $1.45 microfiche. Contract report to NOAA, May 1970. 39 p, 10 fig, 11 plate, 5 tab, 18 ref. NOAA 3-31-R.

Descriptors: *Clams, *Fish populations, *Growth stages, *Harbors, *New Hampshire, Environmental effects, Sediments, Dredging, Tidal effects, Surveys, Shellfish farming, Artificial substrates.
Identifiers: *Hampton Seabrook Harbor (N.H.).

Over the three years of the study in Hampton Seabrook Harbor, N. H., eight clam flats were surveyed with an alidade and square foot samples taken at pre-established locations. The estimated standing crop for the eight flats studied was 24,000 bushels. In addition to standing crop estimates, growth studies were conducted from which growth to a legal size of two inches was estimated at four years. Growth and clam densities varied in different substrates with combined sand and silt substrates providing optimal growth. A five-acre blue mussel bed was reclaimed with dredged sand in 1965. In the three years that followed, young clams were successful in setting and growing in the artificial substrate after compaction of sediments occurred from wind and tidal action. Newly set clams, however, were in direct competition with corresponding sets of blue mussels. (Woodard-USGS)
W73-14151

ESTIMATION OF ESTUARINE MARSH PRODUCTIVITY,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-14199

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INTERFACE CONDENSATION DESALINATION MEMBRANES,
Westinghouse Electric Corp., Pittsburgh, Pa. (assignee).
L. C. Scala, D. F. Ciliberti, and D. Berg.
U.S. Patent No 3,744,642, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 551, July 10, 1973.

Descriptors: *Patents, *Desalination, *Membranes, Salt water, Impurities, *Polymers, Water treatment, Demineralization.

An interface condensation desalination membrane substrate composite which would be effective in permitting the effusion of pure water and the rejection of dissolved salt impurities is described. It comprises a substrate having pores between about 0.03 to 8 microns diameter and a membrane layer of polymeric material selected from the group consisting of polyamide, polyphenylester and polysulfonamide polymers which is in contact with the substrate. (Sinha-OEIS)
W73-13973

WATER SUPPLY AND TREATMENT IN TWO REGIONS OF SAUDI ARABIA,
Wisconsin Univ., Milwaukee. Dept. of Energetics.
For primary bibliographic entry see Field 05F.
W73-13995

NITRATE REMOVAL BY ION EXCHANGE,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
For primary bibliographic entry see Field 05D.
W73-14008

3B. Water Yield Improvement

WATER AND PHOTOSYNTHESIS RELATIONS OF DESERT PLANTS IN THE MAURITANIAN SAHARA: II. ALTERNATING-GREEN, SWITCH-BRANCHED AND STEM-SUCCULENT TREES,
Technische Hochschule, Darmstadt (West Germany).
For primary bibliographic entry see Field 02I.
W73-13801

PROGRESS REPORT ON AQUATIC WEED AND ALGAE CONTROL STUDIES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 05G.
W73-13912

SOME CURRENT PROBLEMS OF RAIN STIMULATION RESEARCH,
California Univ., Berkeley. Statistical Lab.
J. Neyman, and E. L. Scott.
In: Proceedings (Vol. III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 1167-1221, (1972). 8 fig, 7 tab, 26 ref, 1 append.

Descriptors: *Weather modification, *Rainfall, *Experiments, *Arizona, Canada, Cloud seeding, Precipitation, Hydrology, Atmosphere, Data collections, Digital computers.
Identifiers: *Rain stimulation, Switzerland, Wind direction.

Particular problems in rain stimulation studies which have international implications and appear of paramount importance are discussed. The overall general rain stimulation problem is the necessity to understand the mechanisms of the phenomena which go on in the atmosphere when an effort is made to stimulate rain. Knowledge of these 'facts' is vital and digital computers are used continuously in search of such facts. However, fruitful computer modeling in actual experimentation with weather control must be preceded by consideration of two problems: (1) The establishment of what the hard facts are or were in specified circumstances, which in turn requires (2) thought of how the hard facts relating to weather modification can be established. The only source of reliable information on weather control is well-designed randomized experiments (particularly cloud-seeding). Some details of the March 1972 Skywater Conference VII are discussed, and the results of two notable experiments are recounted, one having taken place in Switzerland and the other in Arizona. (See also W73-14166) (Bell-Cornell)
W73-14179

3C. Use of Water of Impaired Quality

CATENARY SOIL RELATIONSHIPS IN ISRAEL: II. THE BET GUVRIN CATENA ON CHALK AND NARI LIMESTONE CRUST IN THE SHEFELA,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 02G.
W73-13720

REACTOR COOLING WATER FOR AGRO-INDUSTRIAL DEVELOPMENT,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 05D.
W73-13819

SEWAGE SLUDGE INCORPORATION IN EXPERIMENTAL FIELD PLOTS TO EVALUATE HAZARDS AND BENEFITS, AND DEVELOP TECHNIQUES FOR OPTIMIZING BENEFITS AND MINIMIZE HAZARDS (FINAL ENVIRONMENTAL STATEMENT).
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-13860

PACKAGE SEWAGE TREATMENT PLANT,
For primary bibliographic entry see Field 05D.
W73-13976

EFFECTS OF SALINE WATERS UPON SURVIVAL OF FISH EGGS AND LARVAE AND UPON THE ECOLOGY OF THE FATHEAD MINNOW IN NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-13981

INDUSTRIAL LAND APPLICATION SPRAYFIELD DISPOSAL AND WILDLIFE MANAGEMENT CAN COEXIST,
Weston Paper and Mfg. Co., Terre Haute, Ind.
For primary bibliographic entry see Field 05D.
W73-14056

INFLOW, OUTFLOW, AND WATER QUALITY OF MISSION LAKE, NORTH-CENTRAL MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 05G.
W73-14100

ROLE OF DEPTH AND QUALITY O WATERTABLE ON SOIL SALINIZATION,
Central Soil Salinity Research Inst., Karnal (I dia).
For primary bibliographic entry see Field 02G.
W73-14122

ENVIRONMENTAL POLLUTION BY POTASSUM PLANT WASTES (ZAGRYAZNENIY OKRUZHAYUSHCHEY SREDY OTKHODAM KALIYNOGO PROIZVODSTVA),
For primary bibliographic entry see Field 05C.
W73-14148

3D. Conservation in Domestic and Municipal Use

FORECASTS FOR THE FUTURE-POPULATION,
Geological Survey, Carson City, Nev. Water Resources Div.
For primary bibliographic entry see Field 06B.
W73-13674

URBAN STORM DRAINAGE AND FLOOD CONTROL IN THE DENVER REGION--FINAL REPORT.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 04A.
W73-13677

STORM DRAINAGE PLAN STUDY DESIGN.
Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 04A.
W73-13683

REGIONAL WATER SUPPLY/SEWAGE DISPOSAL PLAN AND SHORT-RANGE PROGRAM, 1973-1978.
Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 05D.
W73-13684

PRICE ELASTICITY OF DEMAND FOR MUNICIPAL WATER: A CASE STUDY OF TUCSON, ARIZONA,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 06D.
W73-13698

CONVENTIONAL AND UNCONVENTIONAL ALTERNATIVES FOR WATER SUPPLY MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 04A.
W73-13701

STORM DRAINAGE AND FLOOD CONTROL CRITERIA: OBJECTIVES, PREMISES, PRINCIPLES, STANDARDS.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 04A.
W73-13760

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04C.
W73-14111

3E. Conservation in Industry

FORECASTING WATER USE FOR ELECTRIC POWER GENERATION,
City Univ. of New York. Dept. of Mathematics.
For primary bibliographic entry see Field 06D.
W73-13705

A MULTISECTORAL MODEL OF PACIFIC AND MOUNTAIN INTERSTATE TRADE FLOWS,
British Columbia Univ., Vancouver. School of Community and Regional Planning.
For primary bibliographic entry see Field 06A.
W73-13986

INSTITUTIONAL IMPLICATIONS OF U.S. DEEPWATER PORT DEVELOPMENT FOR CRUDE OIL IMPORTS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-13987

TAPPI ENVIRONMENTAL CONFERENCE, 1972.
Technical Association of the Pulp and Paper Industry, Atlanta, Ga.
For primary bibliographic entry see Field 05D.
W73-14050

3F. Conservation in Agriculture

PROTECTION OF A UNIQUE ECOLOGICAL AREA THROUGH IMPROVED WATER AND FERTILITY MANAGEMENT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-13667

CONDITIONAL CHANCE-CONSTRAINED MODEL FOR RESERVOIR CONTROL,
London Graduate School of Business Studies (England). Dept. of Operations Research and Statistics.
For primary bibliographic entry see Field 04A.
W73-13700

AN EVALUATION OF SOIL WARMING FOR INCREASED CROP PRODUCTION,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-13710

ACTUAL POTENTIAL AND EQUILIBRIUM EVAPORATION FOR A BEAN FIELD IN SOUTHERN ONTARIO,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02D.
W73-13721

DYNAMICS OF FREE AMINO ACID CONTENT IN MAIZE PLANTS IN CONNECTION WITH SOIL WATER REGIME (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
S. I. Slukhai, and O. E. Shvedova.
Fiziol Biokhim Kul't Rast, Vol 4, No 2, p 151-156, 1972, Illus, English summary.
Identifiers: *Amino-Acids, *Maize plants, *Soil water regime.

During the vegetation period the content of free amino acids in maize leaves with a soil water deficit was higher than with a normal water supply. This indicates an increase in the content of NH4 + entering the reactions of direct amination with organic acids as well as a decrease in protein synthesis. Under conditions of water-supply deficit an increase in the content of asparagine, aspartic and glutamic acids, serine, glycine and alanine in leaves was observed.--Copyright 1973, Biological Abstracts, Inc.
W73-13804

INFILTRATION ANALYSIS AND ITS APPLICATION ON IRRIGATION DESIGN IN THE INFERIOR VALLEY OF COLORADO RIVER (IN SPANISH),
Universidad Nacional del Sur, Bahia Blanca (Argentina).
P. C. Fernandez, J. A. Luque, and J. D. Paoloni.
Rev Invest Agropecu Ser 3 Clima Suelo, Vol 8, No 1, p 1-29, 1971, English summary.
Identifiers: *Argentina (Colorado River), Equations, *Infiltration, *Irrigation design, River.

A theoretical analysis of the nonlinear partial differential equation governing the infiltration of water into soil is used in order to describe the soil and water parameters that influence the process. Because numerical solutions of this partial differential equation are possible only under assumptions which are remote from the real situation, the use of the well-known empirical equation of Kostiakov is recommended for use in irrigation design. A detailed description of the practical application of the Kostiakov equation is shown with the use of field data. A graphic solution of the basic intake rate equation is presented for practical purposes and recommendations in relation with the use of the infiltration equations in irrigation design are formulated.--Copyright 1973, Biological Abstracts, Inc.
W73-13805

INFILTRATION CHARACTERISTICS OF FURROW IRRIGATION IN A HEAVY-TEXTURED SOIL,
Agricultural Univ., Wageningen (Netherlands). Afdeling Weg- en Waterbouwkunde.
C. J. Grassi.
Meded Landbouwhogesch Wageningen. Vol 72, No 7, p 1-127. 1972. Illus.
Identifiers: Flow, *Furrow irrigation, *Infiltration, Irrigation, Moisture, Soils (Textured).

The rate and pattern of infiltration of soil water, under the conditions of heavy texture and shallow depth in a tropical furrow-irrigated soil, was studied. Three series of experiments were set out: 1st series with variable inflow and surface roughness; 2nd series with variable initial soil moisture content; 3rd series with variable furrow length. Five irrigations were applied during the period, Jan.-March, 1970. Subsequently in the 1st series of experiments, 1st, 3rd and 4th irrigations for 3 roughness conditions and 4 sizes of flow were tested. The 2nd irrigation was used for the 2nd series of experiments. The 5th irrigation served for the 3rd series of experiments. The following measurements were taken: rate of advance of the water front (distance x in m at time t in min); furrow section parameters (top width T and depth h); furrow inflow Q and outflow Q out; the simultaneous inflow and outflow. Advance and infiltration functions are obtained for the period of advance of the water front (first stage), and infiltration functions for the period of wetting the root zone (second stage). Water losses by deep percolation and by run-off at the end of the run were analyzed on the basis of the equations found. Data analysis showed that infiltration is a very variable factor affected by the conditions of the soil and the surface of the channel bed, as well as by the size of the flow, furrow length and stage of irrigation. Soil cracking upon drying was a relevant factor in the entry of water into the soil.--Copyright 1973, Biological Abstracts, Inc.
W73-13811

PLANT-SOIL RELATIONS,
Universidad Nacional de Colombia, Palmira. Facultad de Agronomia.
J. A. Gomez.
Acta Agron (Palmira). Vol 21, No 3, p 141-143. 1971.
Identifiers: Earthworms, Fertilizers, Irrigation, Microorganisms, Pests, Soils, Weeds, *Plant-soil relationships, Crops.

Soil is not strictly necessary for plant production as is shown by hydroponics, and even poor soils can be made to produce excellent crops by the use of advanced techniques. In underdeveloped countries there are large areas where the soil is poor, but where the population nevertheless depends on it to produce crops of some sort. With advances in development, the productivity of the soil can be greatly increased by fertilizers, irrigation, drainage, pest and weed control, etc. It is possible to dispense with many of these artificial aids by employing earthworms and certain microorganisms to improve the structure and nutrient content of the soil.--Copyright 1973, Biological Abstracts, Inc.
W73-13812

DISPOSAL OF BEEF FEEDLOT WASTES ONTO CROPLAND,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05E.
W73-13830

AGRICULTURAL WASTES--A MANAGEMENT PROBLEM,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 05B.
W73-13838

YIELD OF FLUE-CURED TOBACCO AND LEVELS OF SOIL OXYGEN IN LYSIMETERS WITH DIFFERENT WATER TABLE DEPTHS,
Agricultural Research Service, Florence, S.C. Soil and Water Conservation Research Div.
R. B. Campbell, and G. T. Seaborn.
Agron J Vol 64, No 6, p 730-733. 1972. Illus.
Identifiers: Alkaloids, *Carbon dioxide, Growth, Lysimeters, Nicotiana-Tabacum, *Oxygen, Root, Shoot, *Soil aeration, Sugars, *Tobacco yield, Water tables.

Flue-cured tobacco (Nicotiana tabacum L.) was grown in lysimeters with static water-table levels at 30, 45, 60 and 90 cm below the soil surface to more clearly define the level at which a favorable balance between soil aeration and water supply is attained. The O2 and CO2 content of the soil air was determined periodically at various depths. Water-table treatment effects were evaluated in terms of root and shoot growth, yield and quality of tobacco. Dry leaf yields for the 90-, 60- and 45-cm water-table treatments were all significantly (P greater than or equal to 0.05) greater than that for the 30-cm treatment. Yields for the 60- and 90-cm water-table levels were larger, but not significantly (P greater than or equal to 0.05) larger than the 45-cm treatment. The yield difference between the 60- and 90-cm treatments was not significant (P greater than or equal to 0.05). Roots of tobacco recovered from soil above the 60- and 90-cm water tables weighed only 10% more than roots recovered from soil above the 30-cm water table. Average CO2 and O2 gradients in the soil above the water table were nearly equal but of opposite sign. Soil environmental conditions imposed by the 60-cm water-table treatment provided the most favorable balance between aeration and water supply for tobacco.--Copyright 1973, Biological Abstracts, Inc.
W73-13908

ROOTPLOWING AND SEEDING ARID RANGELANDS IN THE SOUTHWEST,
Agricultural Research Service, Las Cruces, N. Mex. Jornada Experimental Range.
C. H. Herbel, G. H. Abernathy, C. C. Yarbrough, and D. K. Gardner.
Journal of Range Management, Vol 26, No 3, p 193-197, May 1973. 3 tab, 3 fig, 2 ref.

Descriptors: *Seeds, *Planting management, *Soil-water-plant relationships, *Soil properties, *Southwest U.S., New Mexico, Arid lands, Ranges, Plant growth, *Vegetation establishment, Range grasses, Grama grasses, Desert plants, Range management, Forage grasses.
Identifiers: Lehmann lovegrass, Boer lovegrass, Black grama, Sideoats grama, Yellow bluestem, Blue panic, Fourwing saltbush, Alkali sacaton.

Past grazing abuses, droughts, and brush encroachment have contributed to severe depletion of desirable vegetation on some arid rangelands in the Southwest, where seeding desirable species now affords the only hope of recovery. But the establishment of seeded species in arid regions is difficult. In this study, 23 plots were seeded across southern New Mexico from 1966 to 1970 with experimental seeding equipment. The equipment was developed for rootplowing and seeding brush-infected range, such as creosotebush or tarbush, in one pass over the land. With such treatment good to excellent stands were obtained on 10 plots while 4 had only fair stands. Many of the seeding failures were related to site conditions with erosive, droughty, or heavily crusted soils. On the sandy and loamy creosotebush sites seeding was most easily established with Lehmann and Boer lovegrass, black and sideoats grama, yellow bluestem, blue panic, and fourwing saltbush. Sideoats grama, yellow bluestem, and alkali sacaton were the best ecotypes for the heavier tarbush soils. The exact seed mixture for any site depends on the objectives of management. (Gloyd-Arizona)
W73-13998

STRESS METABOLISM. I: NITROGEN METABOLISM AND GROWTH IN THE BARLEY PLANT DURING WATER STRESS,
Waite Agricultural Research Inst., Glen Osmond (Australia).
T. N. Singh, L. G. Paleg, and D. Aspinall.
Australian Journal of Biological Sciences, Vol 26, No 1, p 45-56, Feb. 1973. 9 fig, 1 tab, 25 ref.

Descriptors: *Plant growth, *Plant physiology, *Nitrogen, *Metabolism, *Amino acids, Barley, Seeds, Roots, Moisture stress, Proteins, Crop response, Leaves.
Identifiers: Proline content, Stress metabolism.

An induced water deficit in 10-day barley seedlings resulted in a decrease in leaf dry weight within a 28-hour period, although shoots and roots continued to increase in weight. Results showed that primordium formation and apex elongation on the main shoot were inhibited, but floral development at the apex continued. These effects were accompanied by a marked increase in the free proline content of all plant organs, the rate of accumulation being greatest in the leaf laminae. Variations in the amounts of other free amino acids in the leaves, particularly aspartate and glutamate, with the onset of water stress were considerably less than that of proline. Accumulated proline was metabolized rapidly once the tissue water deficit was relieved. Soluble protein content of leaves and roots continued to increase for some 20 hours after water stress was imposed, but eventually fell. Net protein synthesis was rapidly resumed once the water stress was relieved. The amount of proline associated with trichloroacetic acid-precipitable protein fraction increased during water stress and fell to the control level upon rewatering. If roots were aerated, accumulation of free proline in the roots was inhibited. In these circumstances, the proline content of the shoot was increased such that the total amount of free proline in the whole plant was unaffected by root aeration. (Bahre-Arizona)
W73-14004

ARIZONA AGRI-FILE.

Arizona University, Tucson, Cooperative Extension Service, 1973. 15 sheets.

Descriptors: *Arizona, *Agriculture, *Statistics, *Crop production, *Livestock, Vegetable crops, Fruit crops, Cotton, Government supports, Farm prices.

A series of statistical sheets on each of Arizona's 14 counties, together with a State summary, covers in capsule form pertinent information on the geography and agriculture of each, giving percentage of land area in Federal, State, private, and Indian reservation holdings, physiography, and climate. Agricultural information covers statistics on crops, both field and vegetables/melons, including acreage, yield per harvested acre, and production; citrus, deciduous fruit, and pecans; cash receipts from farm marketings; livestock on farms; government payments; and livestock production and marketings, each category showing comparative figures for 1970, 1971, and 1972. The State summary gives totals for the same categories, with some examples showing 899,000 cattle marketed from feedlots in 1972; 25,658 acres in oranges in 1973; 466 bales of upland cotton produced on 241,000 acres in 1971; cash receipts from marketing of Arizona's agricultural products, $786 million in 1972, up 7 percent from 1971. (Paylore-Arizona)
W73-14006

EFFECT OF WILTING AND SOIL DROUGHT ON ENDOGENOUS GROWTH REGULATORS OF MESOPHYTE PLANTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
T. N. Pustovoitova.
Fiziol Rast. Vol 19, No 3, p 622-628. 1972, Illus. (English summary),
Identifiers: Abscisic-Acid, Apricot, Bean, Castor-Oil, *Drought, Endogenous growth, Hemp, *Mesophyte plants, Plant regulators, Soils, Wheat, *Wilting, Dehydration.

The dehydration of intact young plants of bean and wheat, of cut leaves of castor-oil plants and hemp as well as the effect of soil drought on one-year-old apricot seedlings resulted in the formation of inhibitors in the leaves of these plants and in the decreased activity of growth stimulants. The accumulation of growth inhibitors in the leaves was detected during slight dehydration. The process does not depend on the type of metabolism or the phase of plant growth. Growth inhibitors formed during wilting are phenol compounds and abscisic acid. The impaired growth of the mesophytic plants is due to the decrease of phytohormone content and to the accumulation of growth inhibitors.--Copyright 1973, Biological Abstracts, Inc.
W73-14021

OPEN-FILE MAPS SHOWING ALTITUDES IN SHALLOW GRAVEL AQUIFERS IN MARCH 1973, IN COLUMBIA BASIN IRRIGATION PROJECT AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 07C.
W73-14108

IDENTIFICATION AND MAPPING OF SOILS, VEGETATION, AND WATER RESOURCES OF LYNN COUNTY, TEXAS, BY COMPUTER ANALYSIS OF ERTS MSS DATA,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 07B.
W73-14128

AGRICULTURE, FORESTRY AND RANGELAND RESOURCES,
Oregon State Univ , Corvallis.
For primary bibliographic entry see Field 07B
W73-14132

IRRIGATION RATES AND WATER LOSSES DURING IRRIGATION (POLIVNAYA NORMA I POTERI VODY PRI OROSHENII),
A. P. Aver'yanov.
Pochvovedeniye, No 9, p 95-100, September 1972. 3 tab, 19 ref.

Descriptors: *Land reclamation, *Irrigation practices, *Rates of application, *Water loss, Irrigation systems, Irrigation water, Evaporation, Transpiration, Soil groups, Soil moisture, Moisture content, Field capacity, Bulk density, Wheat, Growth stages, Equations.
Identifiers: USSR.

A method is described for computing net and gross irrigation rates. The net irrigation rate is determined from the water volume needed to bring the moisture content of the active layer of soil to maximum field-moisture capacity, and a coefficient is introduced to account for the amount of water penetrating and filtering through this layer. The gross irrigation rate is determined by introducing a coefficient which allows for water loss through evaporation during irrigation and soil-moisture redistribution. Comparisons are made of computed and actual gross irrigation rates for irrigation of wheat in the Kuybyshev, Saratov, and Volgograd Oblasts in Middle and Lower Volga regions. (Josefson-USGS)
W73-14146

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

URBAN STORM DRAINAGE AND FLOOD CONTROL IN THE DENVER REGION--FINAL REPORT.
Denver Regional Council of Governments, Colo.

Available from NTIS , Springfield, Va. 22151 as PB-218 962 Price $3.00 printed copy; $1.45 microfiche. Denver Urban Drainage and Flood Control District, Project REUSE Final Report DRCOG-72-008, August 1972. 220 p, 25 fig, 40 tab.

Descriptors: *Urban runoff, *Urban hydrology, *Comprensive planning, *Storm drains, Flood control, *Colorado, Water management (Applied), Social aspects, Legal aspects, Planning, Storm runoff, Sewers.
Identifiers: *Denver (Colo).

A proposed 20-year (1971-1990) regional program is presented for major drainage in the Denver region. A regional perspective, the urban system concept, description of the existing major drainage system, management responsibilities, criteria, assumptions and uncertainties, the four alternative concepts developed for consideration, and an evaluation of those concepts are also given. The program includes proposed short-range activities for 1971-1975, and a long-range program to achieve 100-year frequency storm protection throughout the region by 1990, including preventive measures, facility construction, and flood insurance. This report is one of a series, related to urban drainage and flood control, resulting from Project REUSE (Renewing the Environment

through Urban Systems Engineering). (Knapp-USGS)
W73-13677

STORM DRAINAGE PLAN STUDY DESIGN.
Central New York Regional Planning and Development Board, Syracuse.

Available from NTIS, Springfield, Va., 22151, PB-218 385 Price $3.00 printed copy; $1.45 microfiche. November 1972. 15 p. HUD 246-04.

Descriptors: *Urban runoff, *Storm runoff, *Storm drains, *Flood control, *Planning, Legislation, Urban hydrology, New York, Water management (Applied).

The nature and scope of a storm drainage and flood protection plan are described, identifying what information is needed, what studies should be made, and what results should be sought by its formulation. Planning methodology to be followed is outlined and the inventories which must be made, consisting of those for soils and geologic data, demographic and land use data, hydrologic data, and administrative and regulatory data are described. Initial plan and program formulation is described, including the designation of optional storm drainage and flood control policies and their subsequent review. Necessary implementation steps are also outlined. (Knapp-USGS)
W73-13683

REGIONAL WATER SUPPLY/SEWAGE DISPOSAL PLAN AND SHORT-RANGE PROGRAM, 1973-1978.
Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 05D.
W73-13684

LAND USE CLASSIFICATION USING TEXTURE INFORMATION IN ERTS-A MSS IMAGERY,
Kansas Univ., Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W73-13685

DISCHARGE OF SUSPENDED SEDIMENT IN THE LITTORAL ZONE OF THE KAKHOVKA RESERVOIR,
For primary bibliographic entry see Field 02J.
W73-13691

DESIGN OF SYSTEMATIC DRAINAGE WITH EVAPORATION AND TRANSPIRATION,
For primary bibliographic entry see Field 02D.
W73-13693

CONDITIONAL CHANCE-CONSTRAINED MODEL FOR RESERVOIR CONTROL,
London Graduate School of Business Studies (England). Dept. of Operations Research and Statistics.
M. Lane.
Water Resources Research, Vol 9, No 4, p 937-948, August 1973. 2 fig, 3 tab, 15 ref.

Descriptors: *Reservoir releases, Management, Agriculture, *Benefits, *Irrigation water, *Stochastic processes, *Linear programming, Decision making, Rainfall, Flows, Hydrology, Demand, Optimization, Mathematical models, Systems analysis, Risks.
Identifiers: *Chance-constrained programming, *Control policies, Cropping patterns.

The problem of reservoir management is to control flows from the reservoir so that the possibly conflicting demands for flood protection, recreation, hydroelectric power, irrigation, or urban demand are best satisfied. To achieve this, account must be taken of the random nature of flows entering the reservoir, and the control policies must be designed to cover a wide range of possible occurrences. A model for designing the optimum control policies of a reservoir serving an agricultural area is presented. Policies are designed to maximize the expected agricultural benefits to the area. The demand for irrigation water depends on both the crops planted and the rainfall in the area. Explicit account is taken of both, particularly the stochastic nature of the rainfall, which is characterized as a joint log normally distributed random variable. The problem lends itself to a conditional chance-constrained formulation. However, the dependency of the rainfall distributions and agricultural functions does not lead to conveniently solvable deterministic equivalents. As a result, decision rules are defined for each of a series of sequences of rainfall intervals. The problem then reduces to a linear programming form. The novelty of the approach lies in the fact that the decision rules are conditional rules whose parameters depend on previous observations of the random variable. (Bell-Cornell)
W73-13700

CONVENTIONAL AND UNCONVENTIONAL ALTERNATIVES FOR WATER SUPPLY MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. K. Davis, and S. H. Hanke.
Water Resources Research, Vol 9, No 4, p 861-870, August 1973. 5 tab, 18 ref.

Descriptors: *Simulation analysis, *Potomac River, *Water supply, *Reservoirs, Storage capacity, Economic efficiency, Project planning, Cost sharing, *Alternative planning, Municipal water, Water requirements, Water use, Seasonal, *Cost analysis, Pumping, Estuaries, Federal government, Computers, Mathematical models, Systems analysis, *District of Columbia.
Identifiers: *Washington (D.C.).

A computer simulation of the Potomac River basin system run under conditions projected for the year 2010 has been utilized to analyze the performance of three water supply systems proposed as alternatives to meet the Washington, D.C., metropolitan area's demand for water. Two of the systems offered additional storage capacity on the Potomac; these systems were found to meet average daily water withdrawal requirements. A third system, a minimum storage plan, offered no new storage capacity but was found feasible if used in conjunction with pumping from the Potomac River estuary and/or accepting drought adjustment. The minimum storage plan was the least costly system in real terms. However, the most costly reservoir systems are favored by local water planners because most of the reservoir costs would be shared by the federal government. Although the real costs of the minimum storage plan are less than those of the reservoir plans, it is not favored, because none of the costs are borne by the federal government. This study illustrates the inefficiencies that can be generated by current cost-sharing policies. (Bell-Cornell)
W73-13701

FORECASTING WATER USE FOR POLICY MAKING: A REVIEW,
Houston Univ., Tex. Dept. of Quantitative Management Science.
For primary bibliographic entry see Field 06D.
W73-13706

AQUATIC PLANTS FROM MINNESOTA PART 4 - NUTRIENT COMPOSITION,
Minnesota Univ., Minneapolis. Dept. of Animal Science.
For primary bibliographic entry see Field 02I.
W73-13716

OVERWINTER DRAWDOWN: IMPACT ON THE AQUATIC VEGETATION IN MURPHY FLOWAGE, WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Research.
For primary bibliographic entry see Field 05C.
W73-13723

TSUNAMI WAVES (VOLNY TSUNAMi).
Sakhalin Kompleksnyi Nauchno-Issledovatelskii Institute, Yuzhno-Sakhalinsk (USSR).
For primary bibliographic entry see Field 02L.
W73-13751

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 1--REQUIREMENTS AND GENERAL PROCEDURES.
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 08B.
W73-13757

HYDROLOGIC RECONNAISSANCE OF STREAMS AND SPRINGS IN EASTERN BROOKS RANGE, ALASKA--JULY 1972,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-13759

STORM DRAINAGE AND FLOOD CONTROL CRITERIA: OBJECTIVES, PREMISES, PRINCIPLES, STANDARDS.
Denver Regional Council of Governments, Colo.

Available from NTIS, Sprinfield, Va., 22151 PB-218 960 Price $3.00 printed copy; $1.45 microfiche. Project Reuse Final Report-Supplemental Publication DRCOG-72-004, May 1972. 34 p, 2 fig. HUD-H-1392.

Descriptors: *Urban runoff, *Flood control, *Storm drains, *Comprehensive planning, *Colorado, Water management (Applied), Social aspects, Legal aspects, Planning, Storm runoff, Sewers.
Identifiers: *Denver.

Regional storm drainage and flood control criteria, including policies, goals, objectives, premises, principles, design and operating standards, external constraints, and plans and programs are reveiwed. Regional criteria were used to derive the storm drainage and flood control criteria. The criteria are also applicable to other urban systems such as solid waste, housing, parks and recreation, transportation, sewage treatment, and the environment. The report is one of a series related to urban drainage and flood control resulting from Project REUSE (Renewing the Environment through Urban Systems Engineering). (Knapp-USGS)
W73-13760

FINAL ENVIRONMENTAL IMPACT STATEMENT, SOPE CREEK DRAINAGE AREA, COBB COUNTY, GEORGIA--AMENDMENT TO ENVIRONMENTAL IMPACT STATEMENT, COBB COUNTY SEWERAGE IMPROVEMENT PROJECT, JULY 1971.
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 05D.
W73-13764

STATUS AND TRENDS IN HYDROLOGICAL FORECASTS: PART A, FORECASTING OF RUN-OFF, RIVER AND LAKE LEVEL, ICE CONDITIONS AND SURFACE-WATER TEMPERATURE,
For primary bibliographic entry see Field 02A.

W73-13769

STATUS AND TRENDS IN HYDROLOGICAL FORECASTS: PART B, FORECASTING OF GROUND WATER, SOIL MOISTURE AND SEDIMENTATION.
For primary bibliographic entry see Field 02A.
W73-13770

THE PROBLEM OF FLOODS AND THEIR COMPUTATION,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02A.
W73-13773

THE FOREST-BOG COMPLEX OF SOUTHEAST ALASKA,
Alaska Univ., College. Dept. of Biological Sciences.
B. J. Neiland.
Vegetatio, Vol 22, No 1-3, p 1-64, 1971, Illus, Map.
Identifiers: *Alaska, *Bogs, Chamaecyparis-nootkatensis-G, Drainage, *Forest-bog complex, Lichens, Liverworts, Mosses, Picea-sitchensis-G, Pinus-contorta-G, Shrubs, Slope, Thuja-plicata-G, Tsuga-heterophylla-G, Tsuga-mertensiana-G.

Major vegetational, environmental, and past accumulation patterns were studied. Three levels of vegetational pattern are: a community type level, (forest, bog and intermediate types); a community level, (major variations within forest, bog and, the intermediate community types); and a subcommunity level, (major patterns of the forest understory and the bog surfaces). Both extensive survey and intensive sampling were carried out in a widespread array of sites. Average density, basal area and frequency of trees are given as relative values and summarized for an importance index. A summary table lists the species found and their frequencies. Dominance homogeneity was used to select stands. The 3 community types blended into one another in a continually varying pattern which, on a gross scale, conformed primarily to surface topography. Forests occurred chiefly on the steep mountain slopes, bogs on land of gentle repose, with intermediate communities on slopes in between these. That the correspondence was with drainage, was shown by forest presence on land of little slope if it were near the ocean or large drainages, or on deep porous substrates, and by bog presence on steep slopes if any local conditions prevented runoff from being rapid the full length of the watershed. Species patterns included dominance of the upland forests by Tsuga heterophylla and Picea sitchensis, with Chamaecyparis nootkatensis, Thuja plicata, and Tsuga mertensiana of local importance.--Copyright 1972, Biological Abstracts, Inc.
W73-13793

DO YOU HAVE TO MOVE 'EM OR CAN YOU LEAVE 'EM,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 05G.
W73-13828

SEEPAGE LOSSES AND FERTILIZER PRESERVATION IN MANURE STACKING PRACTICE,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-13831

CHARACTERISTICS OF CATTLE FEEDLOT SURFACE RUNOFF,
For primary bibliographic entry see Field 05B.
W73-13833

A MODEL WATER CODE, WITH COMMENTARY,
Spessard L. Holland Law Center, Gainesville, Fla.
F. E. Maloney, R. C. Ausness, and J. S. Morris.
University of Florida Press, Gainesville, 1972, 373 p, append. $25.00. OWRR A-009-FLA (5).

Descriptors: *Water law, *Legislation, *State jurisdiction, *Regulation, Weather modification, Administration, Consumptive use, Riparian rights, Prior appropriation, Water permits, State governments, Water resources development, Hydrologic cycle, Reservoirs, Sewerage, Reasonable use, Waste treatment, Well permits, Water quality control, Legal aspects, Well regulations, Judicial decisions, Water rights.
Identifiers: *Model code, Injunctive relief.

A model is presented for the development of a comprehensive regulatory program in eastern states. This program is designed with three purposes: to take into account the hydrologic interrelationship of all types of water resources in the state; to provide greater certainty than is possible under a court-administered reasonable use approach; yet to retain sufficient flexibility to make possible realistic long-range plans for the conservation and wide use of water resources and the elimination of waste. This last goal is to be accomplished through administrative regulation utilizing the best parts of riparian and appropriation systems. Six chapters of text and commentary discuss: administrative structure and operation; regulation of consumptive uses; construction, operation and regulation of water wells and surface water works; protection of water quality; and weather modifics. An extensive index and a table of cases cited follow the commentary. (Dunham-Florida)
W73-13857

BOOMER CREEK CHANNEL IMPROVEMENT (LOCAL FLOOD PROTECTION PROJECT), STILLWATER, OKLAHOMA, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.

Available from National Technical Information Service, U.S. Dept. of Commerce, as EIS-OK-72-5337-F. $4.75 in paper copy, $1.45 in microfiche. May 1972. 39 p, 1 map, 4 tab.

Descriptors: *Oklahoma, *Environmental effects, *Flood control, Water control, Flood routing, Alternative planning, Estimated benefits.
Identifiers: *Environmental Impact Statements, Stillwater (Okla).

The channelization of West Boomer and Boomer Creeks through the city of Stillwater, Oklahoma is proposed. The project will result in flood control benefits and some overall social and aesthetic environmental improvment due to lessening of flood damage. The project will require construction of one new highway bridge, a new railroad bridge, several new culverts, footbridges and drop structures. Some public and private utility, pipelines, sewers, powerlines and telephone lines will be removed, altered or relocated. Some of the construction involved will leave scars but fish and wildlife in the area are thought not to be significantly affected by the project. Alternatives included a reservoir, levees, nonstructural measures, and no development. Appropriate comments were received and included. (Wadley-Florida)
W73-13861

PROGRESS REPORT ON AQUATIC WEED AND ALGAE CONTROL STUDIES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 05G.
W73-13912

WATER MANAGEMENT--BASIC ISSUES.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 06E.
W73-13916

STATEMENT,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13917

THE ROLE OF THE UNITED STATES ARMY CORPS OF ENGINEERS IN WATER MANAGEMENT,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13921

THE ROLE OF THE UNITED STATES BUREAU OF RECLAMATION IN WATER MANAGEMENT ACTIVITIES,
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13922

PLANNING AND IMPLEMENTATION OF WATER AND RELATED LAND RESOURCE DEVELOPMENTS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13923

WATER RESOURCE PLANNING FOR THE SUSQUEHANNA RIVER BASIN,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 06E.
W73-13931

THE WORK OF THE DELAWARE RIVER BASIN COMMISSION,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 06E.
W73-13932

A WATER SUPPLY STUDY OF THE SASKATCHEWAN-NELSON BASIN,
Saskatchewan-Nelson Basin Board, Regina.
For primary bibliographic entry see Field 06E.
W73-13933

WATER RESOURCES PLANNING IN THE OKANAGAN BASIN,
Department of Energy, Mines and Resources, Ottawa (Ontario). Policy and Planning Branch.
For primary bibliographic entry see Field 06E.
W73-13934

NEW CONCEPTS FOR MANAGING THE GREAT LAKES WATER RESOURCES,
Ohio Dept. of Natural Resources, Columbus.
For primary bibliographic entry see Field 06E.
W73-13935

A DISCUSSION OF PLANNING PROCEDURE IN TERMS OF THE OECD NINE BASIC WATER MANAGEMENT PROBLEMS,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06E.
W73-13936

COMPREHENSIVE PLANNING FOR THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06E.

W73-13937

INSTITUTIONAL ARRANGEMENTS FOR THE GREAT LAKES BASIN,
Pennsylvania Dept. of Forests and Waters, Harrisburg.
For primary bibliographic entry see Field 06E.
W73-13938

RESEARCH ACTIVITIES NEEDED FOR PLANNING AND MANAGEMENT IN THE GREAT LAKES,
Army Engineer Div. North Central , Chicago, Ill.
For primary bibliographic entry see Field 06E.
W73-13940

THE INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES: AN INTERNATIONAL, INTERAGENCY AND INTERDISCIPLINARY APPROACH TO A RESEARCH PROGRAMME IN WATER RESOURCES,
Meteorological Service of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 06E.
W73-13941

THE CANADA CENTRE FOR INLAND WATERS: AN APPROACH TO RESEARCH CO-ORDINATION,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 06E.
W73-13942

CANADIAN-UNITED STATES DEVELOPMENT OF THE COLUMBIA RIVER AS RELATED TO ARRANGEMENTS FOR POWER DEVELOPMENT IN THE U. S. PACIFIC NORTHWEST,
Pacific Power and Light Co., Richland, Wash.
For primary bibliographic entry see Field 06E.
W73-13944

THE REGIONAL DEVELOPMENT APPROACH FOR MANAGING WATER IN SPAIN,
Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia.
For primary bibliographic entry see Field 06E.
W73-13945

THE ITALIAN PROGRAMME OF THE 'CASSA PER IL MEZZOGIORNO' AS AN ILLUSTRATION OF MEANS TO ACHIEVE ECONOMIC DEVELOPMENT OBJECTIVES,
Bureau of Scientific Research and Water Coordination Use of 'Cassa per Il Mezzoriorono', Rome (Italy).
For primary bibliographic entry see Field 06E.
W73-13947

FINNISH WATERCOURTS: AN EXAMPLE OF A COMPENSATION PROCEDURE IN THE LOKKA ARTIFICIAL LAKE PROJECT,
Sunnittelukeskus-MKR, Helsinki (Finland).
For primary bibliographic entry see Field 06E.
W73-13953

TREATED WATER STORAGE FOR DESIGN CAPACITY REDUCTION,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W73-13967

OPTIMIZING THE SUPPLY OF INLAND WATER TRANSPORT,
Peat, Marwick, Mitchell and Co., Washington, D.C.
J. F. Hoffmeister, III, and R. de Neufville.
Journal of the Waterways Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 99, No WW3, Proceedings paper No. 9926, p 293-308, August 1973. 12 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Inland waterways, *Transportation, *Supply, *Optimization, Design, Prices, Lakes, Navigation, Rivers, Barges, Constraints, Currents (Water), Equations, Mathematical models, Systems analysis.
Identifiers: *Economic analysis, *Production management, Towed bodies.

A supply model for inland water transport is explored. The model is a technologic production function valid for all circumstances. It is used, in combination with information about relative prices, to determine optimal configurations of tows. It is concluded that: (1) The production function has diminishing marginal returns; (2) it has increasing returns to scale for lakes, but generally decreasing returns to scale for rivers, which implies that whereas it is desirable to build as large as possible for lake (or ocean) transport, there is a definite optimal size for any given river; and (3) fixed guidelines, in terms of horsepower/ton ratios, can be developed for lakes and other environments where currents are negligible, but are generally impossible to determine for river navigation. The optimal design guidelines depend upon relative prices of materials and wages. Total costs are relatively insensitive to additional horsepower beyond that required for the most economical design. (Bell-Cornell)
W73-13968

MARGINAL ECONOMICS APPLIED TO PIPELINE DESIGN,
Toltz, King, Duvall, Anderson and Associates, St. Paul, Minn.
J. M. Osborne, and L. D. James.
Transportation Engineering Journal of American Society of Civil Engineers, Vol 99, No TE3, p 637-653, Proceedings paper No. 9933, August 1973. 5 tab, 18 ref, 2 append.

Descriptors: *Water conveyance, *Economics, *Marginal benefits, *Pipelines, *Design, *Optimization, Costs, Systems analysis, Mathematical models.
Identifiers: Economic surveys, Computations, Sensitivity analysis.

A noncomputer shortcut to the total cost method is developed from marginal economic theory. Marginal economics is a microeconomic tool, created to help find an optimum design; it is based on incremental costs and benefits, stating that additional cost increments should be expended until the incremental benefit realized diminishes to the value of the cost. Marginal economic theory, couples with basic power and headloss relationships, is used to derive an equation which aids in the formulation of optimal pipeline design; examples are included of a few basic situations for water conveyance systems. The examples indicate how the equation can be used and modified to fit design-imposed constraints. An economic design must be sensitive to interest rates, labor rates, and material costs; it should reflect choice of the type of power supply and be dependent on power cost, and it should provide the optimum blend of payments, operation expenses, and maintenance costs. The method developed fulfills all these requirements, saves time and effort, and fits all types of piping problems. Demonstrated is the derivation of a marginal economic relationship applicable to piping problems and the means of organizing piping cost components to allow differentiating between costs and benefits. (Bell-Cornell)
W73-13969

IMPROVING SURFACE WATER CONDITIONS THROUGH CONTROL AND DISPOSAL OF AQUATIC VEGETATION, PHASE II,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering; and Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 05G.
W73-13983

EFFICIENCY OF WATER USE AND ASSOCIATED CHARACTERISTICS OF LEHMANN LOVEGRASS,
Agricultural Research Service, Tucson, Ariz. Plant Science Research Div.
L. N. Wright, and A. K. Dobrenz.
Journal of Range Management, Vol 26, No 3, p 210-212, May 1973. 1 tab, 11 ref.

Descriptors: *Water utilization, *Consumptive use, *Range grasses, *Vegetation establishment, Plant growth, Productivity, Deserts, Grasslands, Laboratory tests, Soil-water-plant relationships, Efficiencies, Drought tolerance, Stomata density, Transpiration deflection, *Southwest U.S.
Identifiers: *Lehmann lovegrass, Plant waxes.

For 35 years on desert grasslands in the Southwest Lehmann lovegrass has shown its capability of acceptable seedling establishment as a rangeland grass. This study was designed to investigate its efficiency of water use, the relationship of seedling drought tolerance to that water use, and the association of transpired water, dry matter production, stomatal density and plant waxes with these factors. Results indicate that the components of efficient water use and the values of water-use efficiency varied among Lehmann lovegrass lines, with Line L-38 being the most efficient in water use, having the highest percentage of seedling drought tolerance, and producing the most dry matter. High deflection values from plant waxes were associated with high efficiency of water use and a high percentage of survival. While stomatal density was shown to be different among the Lehmann lovegrass lines, being higher on the upper surface than on the lower surface of the leaf blade, it did not seem to be associated significantly with either efficient water use or seedling drought tolerance. (Gloyd-Arizona)
W73-13999

SOIL PROPERTIES AND NUTRIENT AVAILABILITY IN TARWEED COMMUNITIES OF CENTRAL WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 02I.
W73-14000

NITROGEN AND PHOSPHORUS AVAILABILITY IN A FERTILIZED RANGELAND ECOSYSTEM OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 02I.
W73-14001

ENERGY FIXATION AND PRECIPITATION-USE EFFICIENCY IN A FERTILIZED RANGELAND ECOSYSTEM OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 02I.
W73-14002

PERIWINKLE CREEK RC AND D PROJECT MEASURE, UPPER WILLAMETTE RC AND D PROJECT, OREGON (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from NTIS, Springfield, Va. 22151 as EIS-OR-73-0062-F - Price $3.00 printed copy; $1.45 microfiche. Report USDA-SCS-ES (ADM)-73-RD-2 (F), January 1973. 42 p, 3 append.

Descriptors: *Environmental control, *Flood control, *Watershed management, *Oregon, *Conservation, Sediment control, Erosion control, Water pollution control, Fish conservation, Land use, Public health, Recreation facilities, Economics, Planning, Reviews, Evaluation.
Identifiers: Periwinkle Creek (Ore), Linn County (Ore), *Environmental Impact Statements.

This environmental statement concerns community improvements covered by resource conservation and development measure plan which would reduce streambank erosion, sediment deposition, flood damage, drainage problems, water pollution, fish loss by stranding, public health problems, and development encroachment on good farm lands in Periwinkle Creek, Linn County, Oregon. The measure will improve the tax base and pattern of suburban development and increase facilities for public waterbased recreation, employment, personal income, land values, and general business activity. The planned works of improvement include land treatment supplemented by 13,200 feet of floodway, 17,100 feet of open channels, two ponds, and facilities for waterbased recreation in two community parks. (Woodard-USGS)
W73-14106

SOME ASPECTS OF HYDROMETEOROLOGY,
India Meteorological Dept., New Delhi.
For primary bibliographic entry see Field 02A.
W73-14124

SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM EARTH RESOURCES TECHNOLOGY SATELLITE-1, MARCH 5-9, 1973, VOLUME II SUMMARY OF RESULTS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-14126

REVIEW OF ERTS-1 STATUS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-14127

APPLICATION OF ERTS-1 IMAGERY TO FLOOD INUNDATION MAPPING,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 07B.
W73-14131

AGRICULTURE, FORESTRY AND RANGELAND RESOURCES,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 07B.
W73-14132

LAND USE AND MAPPING,
Dartmouth Coll., Hanover, N.H.
For primary bibliographic entry see Field 07B.
W73-14133

MINERAL RESOURCES, GEOLOGIC STRUCTURE, AND LANDFORM SURVEYS,
Cincinnati Univ., Ohio.
For primary bibliographic entry see Field 07B.
W73-14134

WATER RESOURCES,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-14135

THE EARTH RESOURCES PROGRAM OF THE CORPS OF ENGINEERS,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-14136

APPLICATION OF ERTS-1 DATA TO AID IN SOLVING WATER RESOURCES MANAGEMENT PROBLEMS IN THE STATE OF CALIFORNIA,
California Univ., Davis.
For primary bibliographic entry see Field 07B.
W73-14137

APPLICATION OF ERTS RESULTS TO LAND AND RESOURCE MANAGEMENT IN THE STATE OF MISSISSIPPI,
Mississippi Office of Science and Technology, Jackson.
For primary bibliographic entry see Field 07B.
W73-14138

COMPLEX USE OF WATER RESOURCES (KOMPLEKSNOYE ISPOL'ZOVANIYE VODNYKH RESURSOV).
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.

Izdatel'stvo 'Nauka', Moscow, A. M. Solov'yev, editor, 1972. 156 p.

Descriptors: *Abstracts, *Water resources, *Water utilization, Water requirements, Water supply, Water conservation, Water treatment, Water quality, Water pollution, Waste water (Pollution), Surface waters, Groundwater, Reservoirs, Runoff, Floods, Water balance, Hydrologic cycle, Sediments, Irrigation, Drainage.
Identifiers: *USSR.

Complex use of water resources is examined in this collection of 150 abstracts of data of investigations conducted in 1968-69 by scientific institutes of the USSR Academy of Sciences, academies of the Union Republics, and other establishments and institutions of higher learning in the USSR. The abstracts are grouped under five subject headings: (1) study of water requirements of different branches of the national economy (23 abstracts); (2) study of quantitative and qualitative aspects of water resources (44 abstracts); (3) principles of quantitative redistribution and qualitative transformation of water resources (52 abstracts); (4) study of movement of water masses and their interaction with the environment (20 abstracts); and (5) methods of planning for water-resources complex use (11 abstracts). (Josefson-USGS)
W73-14139

MATHEMATICAL MODELING OF STREAMFLOW (MATEMATICHESKOYE MODELIROVANIYE RECHNOGO STOKA),
For primary bibliographic entry see Field 02A.
W73-14142

WATER AVAILABILITY, CLAY COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-14156

SURFACE-WATER AVAILABILITY, FRANKLIN COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-14159

RECONNAISSANCE OF THE WATE RESOURCES OF THE TULSA QUADRANGLI NORTHEASTERN OKLAHOMA,
Geological Survey, Oklahoma City, Okla
For primary bibliographic entry see Field 07C
W73-14160

INTERNATIONAL SYMPOSIUM ON UNCEI TAINTIES IN HYDROLOGIC AND WATE RESOURCE SYSTEMS, VOL III.
For primary bibliographic entry see Field 06A.
W73-14166

AN APPROACH TO FORMULATING STRATI GIES FOR FLOOD FREQUENCY ANALYSIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06A
W73-14168

ENTROPY IN THE ASSESSMENT OF UNCEI TAINTY IN HYDROLOGIC SYSTEM BEHAVIOR AND IN MATHEMATICAL MODE PERFORMANCE,
California Univ., Davis.
For primary bibliographic entry see Field 06A
W73-14170

A PLANNING MODEL FOR PRELIMINAR NETWORK DESIGN,
Geological Survey, Washington, D.C.
D. W. Moody, and T. Maddock, III.
In: Proceedings (Vol. III), International Sympos um on Uncertainties in Hydrologic and Wate Resource Systems, University of Arizona, Tuc son, Dec. 11-14, 1972. p 1039-1069, (1972). 3 fig, tab, 5 ref.

Descriptors: *Network design, *Data collection Water resources development, *Project planning *Mathematical models, Optimization, Costs, Est mating, Alternative planning, Comprehensiv planning, Forecasting, Water demand, Decisio making, Hydrology, Reservoirs, Equations Systems analysis, Computer programs, Inter-basi transfers, Desalination plants, *Risks.
Identifiers: *Regional planning, Mixed integer pr gramming, Sensitivity analysis, Puerto Rico, In formation systems, Opportunity loss, Diversion Groundwater fields.

Some of the uncertainty associated with forecas ing future water demands and with estimatin water supply available for regional proje development can be reduced by investing in dat collection programs. A water resources informa tion system seeks to provide planners with a suff cient amount of data to minimize the expected op portunity loss. The questions asked are: Wha kinds of data should be collected. When shoul they be collected; how much should be spent t reduce the uncertainty in the water resourc planning process. Since the true values of th model parameters are uncertain, statistica methods are necessary to determine the relativ importance of each parameter to the plannin process. Presented is a planning model which pr vides the vehicle for developing a preliminar design for a data-collection network. The mod utilizes mixed-integer programming to identify minimum-cost set of water resources projects an to determine the sequence of their constructio The model has parameters related to the expecte values of hydrologic and economic factors, an the optimum design's sensitivity to variations i these factors establishes the shape of an opport nity-loss surface, e.g., the difference between th values of the objective function using 'tru parameter values and the estimated paramet values. (See also W73-14166) (Bell-Cornell)
W73-14173

UNCERTAINTIES RESULTING FROM MAN-MADE STRUCTURES,
For primary bibliographic entry see Field 08A.
W73-14174

DESIGNING RESERVOIR CONTROL POLICIES WITH CHANCE CONSTRAINED PROGRAMMING,
London Graduate School of Business Studies (England).
For primary bibliographic entry see Field 06A.
W73-14175

4B. Groundwater Management

EVALUATION OF HYDROLOGICAL PROPERTIES OF AQUITARDS AND THEIR ROLE IN GROUNDWATER MANAGEMENT,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W73-13653

STRUCTURAL AND STRATIGRAPHIC FRAMEWORK, AND SPATIAL DISTRIBUTION OF PERMEABILITY OF THE ATLANTIC COASTAL PLAIN, NORTH CAROLINA TO NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-13666

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-13675

CALIBRATION OF DISTRIBUTED PARAMETER GROUNDWATER FLOW MODELS VIEWED AS A MULTIPLE-OBJECTIVE DECISION PROCESS UNDER UNCERTAINTY,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
For primary bibliographic entry see Field 02F.
W73-13699

LIMITATIONS OF THE ELECTRICAL RESISTIVITY METHOD FOR DETECTING LANDFILL LEACHATE IN ALLUVIAL DEPOSITS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 05B.
W73-13758

ANALOG-MODEL STUDIES OF THE EFFECTS OF RECHARGE WELLS ALONG THE HOUSTON SHIP CHANNEL ON POTENTIOMETRIC SURFACES OF THE CHICOT AND EVANGELINE AQUIFERS, HOUSTON, TEXAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-13762

A FINITE-ELEMENT, PLANAR-FLOW MODEL OF CAMAS PRAIRIE, IDAHO,
Idaho Univ., Moscow. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W73-13763

POLLUTION LOADS IN PERCOLATE WATER FROM SURFACE SPREAD SWINE WASTES,
Maryland Univ., College Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-13822

A MODEL WATER CODE, WITH COMMENTARY,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 04A.
W73-13857

CONTAMINATION OF DISCHARGE WELL FROM RECHARGE WELL,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-13962

'HORIZONTAL' WELLS,
Arizona Univ., Tucson. Agricultural Extension Service.
W. T. Welchert, and B. N. Freeman.
Journal of Range Management, Vol 26, No 4, p 253-256, July 1973. 6 fig, 4 ref.

Descriptors: *Water wells, *Water supply development, Ranges, Water supply, Water loss, Hydrogeology, *Arizona, Wells, *Well casings, Drilling, Construction, *Construction costs, Maintenance costs.
Identifiers: *Horizontal wells, San Carlos Apache Indian Reservation.

Horizontal wells, a recent addition to range water development, have a number of advantages over other more conventional range water supply systems, providing a minimum loss of water, a sanitary water supply, lower construction and maintenance costs, and more opportunities for developing a successful water supply. Favorable geological formations for their development exist throughout a substantial area of the better rangeland in Arizona and the mountain states. The construction of 45 horizontal wells on the San Carlos Apache Indian Reservation during 1967-1969 is described, including site selection, drilling equipment, and the construction process. A horizontal well is defined as a horizontally-cased well in a water-bearing formation. (Gloyd-Arizona)
W73-13997

CATALOG OF RECHARGE BASINS ON LONG ISLAND, NEW YORK, IN 1969,
Geological Survey, Mineola, N.Y.
G. E. Seaburn, and D. A. Aronson.
New York State Department of Environmental Conserv ation Bulletin 70, 1973. 80 p, 2 fig, 10 tab, 10 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Water storage, *New York, Methodology, Storm runoff, Diversion, Hydrologic data, Reviews, Water supply, Sites.
Identifiers: *Long Island (NY).

Basic data are compiled for 2,124 recharge basins in operation in 1969 on Long Island, New York. Data consist of basin location, date of construction, capacity to store water, maximum infiltration area, size, bottom altitude, overflow altitude, land-surface altitude, water-table altitude, drainage area, clogging or lack of clogging, use, geologic environment, and soil environment. Tables summarizing much of the data and a cross reference are included. One of the major methods of disposing of storm runoff from urban and suburban areas on Long Island, New York, is to divert the water into recharge basins. This method of disposal, begun in 1935, helps to augment and conserve water in Long Island's groundwater reservoir--the sole source of freshwater for nearly 3 million people in Nassau and Suffolk Counties. Also included are the quantity and the quality of precipitation, inflow, and infiltration rates at selected basins, and evaluation of the regional effects of recharge basins on the hydrologic system of Long Island. (Woodard-USGS)
W73-14103

HYDROGEOLOGIC DATA FOR THE QUINNIPIAC RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 07C.
W73-14112

GROUND WATER IN THE EUGENE-SPRINGFIELD AREA, SOUTHERN WILLAMETTE VALLEY, OREGON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-14113

WATER RESOURCES OF THE YELLOWSTONE RIVER VALLEY, BILLINGS TO PARK CITY, MONTANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14115

GROUND-WATER RESOURCES OF THE ASHUELOT RIVER BASIN, SOUTHWESTERN NEW HAMPSHIRE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14116

APPLICATION OF GEOMORPHOLOGY IN GROUNDWATER PROSPECTING IN THE ALLUVIAL PLAINS AROUND BURDWAN, WEST BENGAL,
India Institute of Tech., Kharagpur.
For primary bibliographic entry see Field 02F.
W73-14118

WATER AVAILABILITY, CLAY COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-14156

WATER RESOURCES OF THE UPPER WABASH RIVER BASIN, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14157

RECONNAISSANCE OF THE WATER RESOURCES OF THE TULSA QUADRANGLE, NORTHEASTERN OKLAHOMA,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 07C.
W73-14160

4C. Effects on Water of Man's Non-Water Activities

URBAN STORM DRAINAGE AND FLOOD CONTROL IN THE DENVER REGION--FINAL REPORT.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 04A.
W73-13677

STORM DRAINAGE PLAN STUDY DESIGN.
Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 04A.
W73-13683

INFLUENCE OF MAN ON THE HYDROLOGICAL CYCLE: GUIDELINES TO POLICIES FOR

THE SAFE DEVELOPMENT OF LAND AND WATER RESOURCES.
For primary bibliographic entry see Field 02A.
W73-13767

PIPELINES AND TROUT WATER,
M. Burdick.
Wisconsin Conservation Bulletin, Vol 38, No 4, p 18-19, July-Aug 1973.

Descriptors: *Pipelines, *Trout, *Wisconsin, *Environmental effects, Environmental engineering, Engineering structures, State governments, Natural gas, Coordination, Hazards.

A case history of the construction of a natural gas pipeline traversing trout stream country in northeastern Wisconsin is presented to illustrate the problems involved and how they could be solved by cooperation between the builders and a state governmental ecology team. (Brown-IPC)
W73-14048

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
F. H. Tovar.
Texas District open-file report, May 1973. 73 p, 3 fig, 1 tab.

Descriptors: *Hydrologic data, *Urban hydrology, *Urbanization, *Rainfall-runoff relationships, *Texas, Data collections, Streamflow, Stream gages, Flow rates, Peak discharge, Storm runoff, Urban runoff.
Identifiers: *Austin (Tex).

The U. S. Geological Survey, in cooperation with the Texas Water Development Board, began hydrologic studies in the Austin urban area in 1954 to determine the effects of progressive urbanization on infiltration, rates rainfall-runoff relations in the Waller Creek watershed; to provide rainfall and runoff data from the rural Wilbarger Creek watershed to be used for comparative purposes in determining the effects of existing and progressive urbanization in the Waller Creek watershed; and to provide applied research facilities for studies at the University of Texas at Austin. Rainfall and runoff data are presented for the Waller Creek and Wilbarger Creek study areas for the 1971 water year (October 1, 1970, to September 30, 1971). Weighted-mean rainfall was 18.31 inches, 44% below the mean annual rainfall for Austin. Mean daily discharge was 0.25 cfs; annual runoff was 0.73 inches, or 4% of rainfall. One storm period, October 22-23, 1970, was selected for analysis. A summary of rainfall-runoff data for each storm is tabulated. Computations with hydrograph and mass curves for each storm are included. (Woodard-USGS)
W73-14111

4D. Watershed Protection

DEPOSITIONAL BEHAVIOR OF COHESIVE SEDIMENTS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 02L.
W73-13669

HAMLIN BEACH STATE PARK COOPERATIVE BEACH EROSION CONTROL PROJECT, LAKE ONTARIO, MONROE COUNTY, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer Districts, Buffalo, N.Y.
For primary bibliographic entry see Field 08D.
W73-13746

MODEL TEST OF BOX INLET DROP SPILLWAY AND STILLING BASIN PROPOSED FOR TILLATOBA CREEK, TALLAHATCHIE COUNTY, MISS.,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 08B.
W73-13781

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSES: ASSISTANCE PROJECTS, FY 69-71,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
L. H. Keith, and S. H. Hercules.
Copy available from GPO Sup Doc as EP1.23/2:73-755, $1.25; microfiche from NTIS as PB-222 938, $1.45. Environmental Protection Agency Technology Series Report EPA-R2-73-155, May 1973. 82 p, 28 fig, 23 tab, 14 ref. EPA Project 16020 GHZ.

Descriptors: Water pollution sources, Chemical wastes, *Chemical analysis, *Mass spectrometry, *Oil spills, *Pesticides, *Pollutant identification, Analytical techniques, Fishkill, Polychlorinated biphenyls, Organoleptic properties, *Nuclear magnetic resonance, Taste, Odor, Oil pollution, Resins.

A multitude of analyses using gas chromatography-mass spectrometry (GC-MS), nuclear magnetic resonance (NMR), infrared, and fluorescence spectroscopy to identify and measure organic pollutants in water are discussed under eleven project categories. In most cases these analyses have helped to solve, or at least understand more clearly, the related pollution incident and in some cases provided for enforcement of regulatory legislation. Projects included identification of pesticides and PCB's from natural waters, organics from industrial wastewaters and landfill runoffs, organics from paper mill wastewaters and foam, and analyses of oils from oil spills and suspect sources. (EPA)
W73-13662

POLAROGRAPHIC DETERMINATION OF NTA,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
T. B. Hoover.
Copy available from GPO Sup Doc as EP1.23/2:73-254, $0.75; microfiche from NTIS as PB-222 940, $1.45. Environmental Protection Technology Series Report EPA-R2-73-254, June 1973. 44 p, 9 fig, 8 tab, 33 ref. EPA Project 16020-EWE.

Descriptors: *Analytical techniques, *Polarographic analysis, *Nitrilotriacetic acid, Sea water, Sewage, Chemical analysis, Water analysis, *Pollutant identification.
Identifiers: *Bismuth-NTA, *Indium-NTA, Linear sweep voltammetry, Differential pulse polarography.

Pulse differential polarography was found to be a more sensitive and precise method than linear sweep voltammetry for the determination of NTA as the bismuth complex in natural and waste waters. Indium was a less satisfactory complexant. Relative standard deviations of less than 5% were obtained by the dual cell pulse differential technique at 1 ppm NTA and calibrations were linear from 0.01 to 4 ppm. Copper, added at concentrations greater than 10-5 M, caused low analytical results for NTA. No other significant interference by metals or complexants was found. An acetate electrolyte was much better than chloride for the determination of bismuth-NTA complex in sewage-type samples. Recommended procedures are given in the appendix. (EPA)
W73-13665

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1969-SEPTEMBER 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02L.
W73-13679

SULFUR IN SEDIMENTS OF THE PACIFIC OCEAN EAST OF JAPAN (SERA V TIKHOOKEANSKIKH OSADKAKH K VOSTOKU OT YAPONII),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-13687

PATTERNS OF CHANGE IN CHEMICAL COMPOSITION OF IRON-MANGANESE CONCRETIONS IN SEDIMENTS OF THE NORTHWESTERN PART OF THE PACIFIC OCEAN (ZAKONOMERNOSTI IZMENENIY/ KHIMICHESKOGO SOSTAVA ZHELEZO-MARGANTSEVYKH KONKRETSIY V OSADKAKH SEVERO-Z APADNOY CHASTI TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-13688

IRON AND MANGANESE FORMS IN SEDIMENTS OF THE NORTHWEST PACIFIC OCEAN (FORMY ZHELEZA I MARGANTSA V OSADKAKH SEVERO-ZAPADNOY CHASTI TIKHOGO OKEANA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-13689

COMBINED SAMPLING AND FLOW MEASUREMENT,
R. R. Carr.
Public Works, Vol 104, No 4, p 71, April 1973. ref.

Descriptors: *Sampling, *Automation, *Mechanical equipment, *Sewage effluents, *Flow rates, Waste water (Pollution).

A sampler for wastewater treatment plant effluents, which integrates automatic sampling with flow measurement, employs a plastic pipe with special insert as the main body with solenoid operated tapered plungers seated in rubber sleeves to provide valving. The sampler is fastened upright in an open channel and is activated with a timer and battery to allow the backed up liquid to enter the sampler. When the valve plungers drop the sample discharges into a receiving vessel. Daily flow is ascertained by multiplying the total volume collected by the formula constant for the weir or flume. (Little-Battelle)
W73-13708

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 1, FRESHWATER PLANARIANS TURBELLARIANS) OF NORTH AMERICA,
Smithsonian Institution Washington, D.C. Dept. of Invertebrate Zoology.
For primary bibliographic entry see Field 02I.
W73-13736

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 2, THE GENUS ARGULUS (CRUSTACEA; BRANCHIURA) OF THE UNITED STATES,
Smithsonian Institution, Washington, D.C.
For primary bibliographic entry see Field 02I.
W73-13737

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO.3, FRESHWATER SPHAERIACEAN CLAMS (MOLLUSCA: PELECYPODA) OF NORTH AMERICA,
Michigan Univ., Ann Arbor. Museum of Zoology.
For primary bibliographic entry see Field 02I.
W73-13738

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 4, FRESHWATER POLYCHAETES (ANNELIDA) OF NORTH AMERICA,
Smithsonian Institution, Washington, D.C. Dept. of Invertebrate Zoology.
For primary bibliographic entry see Field 02I.
W73-13739

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 5, THE FRESHWATER AMPHIPOD CRUSTACEANS (GAMMARIDAE) OF NORTH AMERICA,
Old Dominion Univ., Norfolk, Va.
For primary bibliographic entry see Field 02I.
W73-13740

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 6, AQUATIC DRYOPOID BEETLES (COLEOPTERA) OF THE UNITED STATES,
Oklahoma Univ., Norman. Dept. of Zoology.
For primary bibliographic entry see Field 02I.
W73-13741

BIOTA OF FRESHWATER ECOSYSTEMS, IDENTIFICATION MANUAL NO. 7, FRESHWATER ISOPODS (ASELLIDAE) OF NORTH AMERICA,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 02I.
W73-13742

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 8, FRESHWATER LEECHES (ANNELIDA: HIRUDINEA) OF NORTH AMERICA,
Michigan Univ., Ann Arbor. Museum of Zoology.
For primary bibliographic entry see Field 02I.
W73-13743

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 9, CRAYFISHES (ASTACIDAE) OF NORTH AND MIDDLE AMERICA,
Smithsonian Institution, Washington, D.C.
For primary bibliographic entry see Field 02I.
W73-13744

HANDBOOK FOR ANALYTICAL QUALITY CONTROL IN WATER AND WASTE WATER LABORATORIES.
National Environmental Research Center, Cincinnati, Ohio.

EPA Report, June 1972. 110 p, 17 fig, 15 tab, 36 ref.

Descriptors: *Laboratory tests, *Laboratory equipment, *Quality control, *Methodology, *Control systems, *Water quality control, Physical properties, Chemical properties, Instrumentation, Evaluation, Testing procedures, Materials, Water analysis, Statistics, Data processing, Data storage and retrieval, Chemical analysis, Monitoring, Computers, Computer programs, Organic compounds, Conductivity, Turbidity, Hydrogen ion concentration, Ions, Electrodes.
Identifiers: Errors, Cleanup, Data interpretation, Organic carbon, Carbon analyzer, pH meters, Atomic absorption spectrophotometry, STORET, Arsenic, Cyanides, Ion selective electrodes, Gas liquid chromatography, Thin layer chromatography, Column chromatography, Reagents.

Subject matter of the handbook is concerned primarily with quality control for chemical and physical tests and measurements. Sufficient information is offered to allow the reader to inaugurate, or to reinforce, a program of analytical quality control which will emphasize early recognition, prevention and correction of factors leading to breakdowns in the validity of data. The first chapter is on the importance of quality control. This introduction is followed by consideration of: (1) laboratory services, i. e., distilled water, CO2-free water, ion free water; (2) instrumental quality control of balances, pH meters, turbidimeters, conductivity meters, spectrophotometers, organic C analyzers, ion electrodes; (3) glassware; (4) reagents, solvents, and gases; (5) analytical performance control with its precision, accuracy and evaluation; (6) data handling and reporting, including storage and retrieval, from report forms to computers; (7) special requirements for trace organic analysis involving sample treatment and types of useful chromatography; and (8) the importance of skills and training in overall quality control. (Mackan-Battelle)
W73-13790

THE EXTINCTION OF FISH AND ACID WATER,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 05C.
W73-13800

AUTOMATION IN WATER PROTECTION AGAINST POLLUTION,
Polskie Towarzystwo Przyrodnikow im. Kopernika, Warsaw.
S. Wrobel.
Wszechswiat, 1, p 18-19, 1972, Illus.
Identifiers: *Automation, Dissolved oxygen, *Poland, Pollution protection, Turbidity, Water pollution.

In Poland, automatic stations are equipped with Honeywell appliances for nonstop testing of dissolved oxygen, redox potential, electrical conductance, turbidity, chloride concentration, temperature, water level and solar radiation. These stations supply data about the purification processes.--Copyright 1973, Biological Abstracts, Inc.
W73-13807

PLUME TEMPERATURE MEASUREMENTS OF SHALLOW, SUBMERGED MODEL DISCHARGES WITH CURRENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg. National Thermal Pollution Research Program.
For primary bibliographic entry see Field 05B.
W73-13821

THE FATE OF SOLUBLE MUCHIN IN THE GASTRO-INTESTINAL TRACT OF SHEEP,
Cambridge Univ. (England). Dept. of Veterinary Clinical Studies.
J. F. Hecker.
Journal of Agricultural Science, Vol 80, p 63-69, 1973, 4 tab, 40 ref.

Descriptors: *Nitrogen, *Sheep, Enzymes, Hydrolysis.
Identifiers: *Soluble mucins, *T.C.A.-soluble mucin, Rumen liquor, Caecal liquor, Faecal liquor, Gastro-intestinal tracts, Fucose, Rhamnose, Hexose, Methyl pentose, Histology.

The fate of soluble mucins in the gastro-intestinal tract of sheep was determined. Incubation of a soluble mucin with liquor from large intestinal contents resulted in loss of mucin. Some of this loss was due to soluble enzymes. The loss of mucin was less when incubation was with rumen liquor and varialbe when with ileal liquor. The mean amounts of nitrogen in a soluble mucin fraction which was soluble in trichloroacetic acid (T.C.A.-soluble mucin) were 2.5, 7.3, and 20.0 mg per 100 ml in rumen, caecal and faecal liquors respectively. These amounts were only a small proportion of the total soluble nitrogen in these fluids. Amounts of T.C.A.-soluble mucin, measured by sugar content, were greatest in contents from the small intestine. When the amounts of T.C.A.-soluble mucin were compared with the amounts of lignin in the samples, there was an increase between the abomasum and the first part of the small intestine and than a decrease to the caecu. Amounts relative to lignin were low in other parts of the gastro-intestinal tract. The liquors was in ileal liquor. The presence of the methyl pentoses, fucose and rhamnose indicates that the T.C.A.-soluble mucin is derived from mucus and bacteria. (East-Central)
W73-13834

IDENTIFICATION OF BEEF CATTLE FEEDLOT ODORS,
Texas Tech Univ., Lubbock. Dept. of Chemical Engineering.
R. M. Bethea, and R. S. Narayan.
Transactions of the ASAE, American Society of Agricultural Engineers, p 1135-1137, 1972, 2 fig., 2 tab., 10 ref. (Order No. T 1135).

Descriptors: *Air pollution, *Odor, *Cattle, *Feed lots, *Farm wastes, *Gases, Gas chromatography, Solubility, Alcohols.
Identifiers: Amines, Aldehydes, Esters, Carbonyls.

The qualitative nature of the gases present in the atmosphere around a beef cattle feedlot was studied. The selective solubility method was adopted for identification of volatile organic compounds caused by cow manure. Gas chromatographic analysis extended the findings of the solubility tests. A feedlot chamber was set up for a 550 pound steer in order to obtain information about compounds present in the atmosphere of enclosed feedlots. The chamber was managed three ways. One week it was thoroughly cleaned and washed each day. The next week it was shoveled out, but not washed. The third week it was not cleaned at all. During the first phase, only a few odoriferous contaminants were generated. When daily washings were discontinued, indole and skatole were detected in the chamber atmosphere. The number of compounds present in this atmosphere increased threefold during the last phase. It is inferred that chamber management has tremendous influence on the organic compounds present in the atmosphere of an enclosed feedlot. (Hisle-East Central)
W73-13836

BACTERIOLOGICAL PROCEDURES FOR ANALYZING WET AND DRIED POULTRY FECES,
Michigan State Univ., East Lansing. Dept. of Poultry Science.
H. C. Zindel, T. S. Chang, and G. R. Carter.
Journal Article No. 5928, Michigan Agricultural Experiment Station, College of Agriculture and Natural Resources, Michigan State University, East Lansing, 1972, 4 p, 2 ref.

Descriptors: *Farm wastes, *Dehydration, *Poultry, *Bacteria, *Chemical analysis, Recycling, Incubation, Michigan.

The accurate analysis of feces, both wet and dry, for chemical and bacteriological content is important since animal feces is a raw product which has great potential if properly gathered, processed and utilized. When Michigan State University began a dehydration process several years ago, it obtained bacteria count and identification as well as chemical analysis for both wet and dry fecal samples. The bacteria present in the feces after the drying process were identified and recorded. Some bacteria were present after the drying process, but they were not thought to be significant because most of them were normal flora in the intestinal tract of chickens and some of them are commonly known contaminants. Their presence either suggested that the retention time of the feces in the dryer was not long enough to destroy all bacterial populations or that they were recontaminated while leaving the drying unit. (Hisle-East Central)
W73-13841

EFFECT OF EUTROPHICATION ON BOD TESTING UNDER TURBULENT CONDITIONS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
H. I. Ali, and J. K. Bewtra.
In: Proceedings 19th Annual Technical Meeting, 'Realism in Environmental Testing and Control,' April 2-5, 1973, Disney Hotel, Anaheim, California, p 432-436, 1973. 7 fig, 11 ref.

Descriptors: *Water analysis, *Biochemical oxygen demand, *Turbulence, Water pollution, Algae, Eutrophication, *Pollutant identification, *Canada.
Identifiers: *Light-dark incubation, *Grand Marais Drain (Windsor).

The effect of turbulence on BOD progression of a waste water sample containing algae and incubated at light-dark 50:50 every day was investigated. Algae from highly polluted Grand Marais Drain (Windsor, Canada) were cultured initially at 8.0 pH (at which many bacteria are inhibited without interfering with the development of most algae) at about 23C in the laboratory under twelve hours of light and 12 hours of darkness alternatively. A significantly lower BOD is obtained with alternate light and dark incubation of a sample containing algal cells than that obtained with standard incubation in dark. With the alternating incubation, rate of photosynthetic oxygen produced by algae is much greater than consumed by respiration. Continuous stirring of the BOD samples containing algal cells results in a significant increase in oxygen production by photosynthesis as compared to the unstirred samples. The light-and-dark incubation method, with continuous stirring would more nearly simulate existing conditions in streams as well as in aerated oxidation ponds and, if properly used, would give more representative BOD parameters than those obtained with standard dark incubation methods. (Jones-Wisconsin)
W73-13909

SOLUBILITY AND OCCURRENCE OF LEAD IN SURFACE WATER,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W73-13960

NATURAL CHEMICAL QUALITY OF WATER RIVERS (MAJOR IONS)--A LITTERATURE REVIEW (QUALITE CHIMIQUE NATURELLE DE L'EAU DES RIVIERES (IONS MAJEURS)--REVUE DE LITTERATURE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 02K.
W73-13988

PHYSICO-CHEMICAL CHARACTERISTICS OF THE MUNICIPAL WASTE WATERS OF THE GREAT MONTREAL AREA (QUEBEC) (CARACTERISTIQUES PHYSICO-CHIMIQUES DES EFFLUENTS URBAINS DE L'AGGLOMERATION DE MONTREAL (QUEBEC)),
National Inst. of Scientific Research, Quebec
For primary bibliographic entry see Field 05B.
W73-13991

DETERMINATION OF THE CONCENTRATION OF MERCAPTANS AND SULFIDE IONS IN AQUEOUS EFFLUENTS, (OPREDELENIE KONTSENTRATSII MERKAPTANOV I SUL'FID-IONA V STOCHNYKH VODAKH),
S. S. Zhustareva, V. G. Krunchak, V. P. Mikhailova, M. A. Lomova, and N. F. Dybtsina.
Bumazhnaya Promyshlennost', No 8, p 13, Aug. 1972.

Descriptors: *Polarographic analysis, Pollutants, *Pulp wastes, *Sulfur compounds, *Sulfides, Chemical analysis, Aeration, Analytical techniques, Effluents, Water analysis, *Pollutant identification.
Identifiers: *Mercaptans, USSR, Kraft mills.

A modified polarographic method for the determination of mercaptans and sulfides in kraft pulp mill effluents utilizes a dropping mercury cathode, a saturated calomel anode, and a mixture of 1 ml 5N hydrochloric acid, 41.7 ml ethanol (95%), and 2.3 ml distilled water as electrolyte. Analyses of specific and overall mill discharges, conducted in an inert helium gas atmosphere, indicated that the presence of sulfides did not interfere with mercaptan determinations. Turpentinic digester relief condensates, sampled from the Kotlas kraft mill, contained 11.5 to 27.6 mg per liter of mercaptans, calculated as methylmercaptan (methanethiol). Exposure of the samples to air for 15 min led to virtually complete oxidation, indicating air-exposed kraft mill effluents are unlikely to contain mercaptans. The new method requires 20 min per test run and has an error limit of 5%. Its sensitivity is 4-5 mg of mercaptan and 2.5-3.2 mg of sulfide per liter. (Stapinski-IPC)
W73-14032

ADAPTATION OF THE TTC TEST TO THE STUDY OF DEHYDROGENASE ACTIVITY OF ACTIVATED SLUDGE USED FOR THE PURIFICATION OF PULP MILL EFFLUENTS (PRZYSTOSOWANIE TESTU TTC DO BADANIA AKTYWNOSCI DEHYDROGENAZ OSADOW CZYNNYCH OCZYSZCZAJACYCH SCIEK I POCELULOZOWE),
For primary bibliographic entry see Field 05D.
W73-14038

AUTOMATED SOLVENT EXTRACTION FOR THE DETERMINATION OF TRACE METALS IN WATER BY AAS (ATOMIC ABSORPTION SPECTROPHOTOMETRY),
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
P. D. Goulden, P. Brooksband, and F. F. Ryan.
American Laboratory, Vol 5, No 8, p 10-14, 16-17, Aug. 1973. 5 fig, 1 tab, 9 ref.

Descriptors: *Water analysis, *Trace elements, *Automation, *Monitoring, *Metals, *Cations, Spectrophotometry, Chemical analysis, Analytical techniques, Chelation, Solvent extractions, Solvents, Zinc, Copper, Iron, Chromium, Manganese, Molybdenum, Flame photometry, Water chemistry.

Increasing needs for monitoring the quality of natural waters prompted the development of a continuous, completely automatic method of trace metal determination. The solvent extraction technique described can handle 40 samples per hour and has a detection limit of 0.5 microgram per liter. It is based on complexing of the metal with ammonium pyrrolidine dithiocarbamate (APDC), followed by quantitative extraction of the complex with methyl isobutyl ketone (MIBK), separation of the MIBK phase, and aspiration into the flame of an atomic absorption spectrophotometer. Although developed and tested primarily for analysis of copper and zinc, the method requires only minor modifications for application to iron, chromium, and other metals, using an air-acetylene flame. Seawater samples have been analyzed using a saline wash solution. Chelating agents other than MIBK can be used, e.g., 8-quinolinol for manganese, and alpha-benzoin oxime for molybdenum. Butyl acetate has been used successfully as solvent. Chloroform and other heavier-than-water solvents reduce the separation problem. In intermittent semiautomatic operations, which may be necessitated, e.g., by cleaning of nitrous oxide-acetylene flame burners, or by sample injection with a syringe when a carbon rod atomizer is used, major benefits can still be realized, e.g., removal of the minimum solvent flow constraint. (Brown-IPC)
W73-14047

DETECTION OF NATURALLY FLUORESCENT PESTICIDES ON SILICA GEL LAYERS,
Moncton Univ. (New Burnswick). Dept. of Chemistry.
V. Mallet, D. Surette, and G. L. Brun.
Journal of Chromatography, Vol 79, p 217-222, May 16, 1973. 2 fig, 3 tab, 21 ref.

Descriptors: *Fluorescence, *Pesticides, *Pollutant identification, Carbamate pesticides, Fungicides, Rodenticides, Insecticides, Miticides, Fumigants, Fluorometry.
Identifiers: Detection limits, *Thin layer chromatography, Benomyl, Coumatetralyl, Diphacin, Fuberidazole, Propyl isome, Quinomethionate, Diphacinone, Synergists, Fluorescent spectra.

A number of fluorescent pesticides, namely, benomyl, coumatetralyl, diphacinone, fuberidazole, propyl isome and quinomethionate, have been investigated on silica gel thin-layer chromatograms. The pesticides were prepared in solutions of methylene chloride. For determination of detection limits, dilution series of each pesticide were prepared in n-hexane from the original solutions. Fluorescene spectra were measured and visual detection limits estimated. In most cases, as little as a few nanograms could be detected. In addition, the effects of heat treatment of the fluorescence were observed. The most pronounced effect is a large bathochromic shift of the fluorescence excitation and emission maxima. (Little-Battelle)
W73-14058

A METHOD FOR THE IDENTIFICATION OF BRANCHED-CHAIN PARAFFINS BY CALCULATION OF THEIR RETENTION INDEX VALUES ON THE BASIS OF MOLECULAR STRUCTURE AND PHYSICAL PROPERTIES,
G. Castello, M. Lunardelli, and M. Berg.
Journal of Chromatography, Vol 76, p 31-44, February 7, 1973. 6 fig, 6 tab, 28 ref.

Descriptors: *Separation techniques, *Gas chromatography, *Physical properties, Pollutant identification, Equations, Mathematical studies.
Identifiers: *Paraffins, *Retention indices, Retention time, Dimethylbutane, Dimethylpentane, Methylhexane, Ethylpentane, Trimethylpentane, Dimethylhexane, Methylethylpentane, Methyloctane, Trimethylhexane, Trimethylheptane, Dimethyloctane, Methylnonane.

The retention times of branched-chain paraffins were shown to depend on their physical properties, especially molecular volume, when non-polar phases were used for their separation. As the molecular volume depends strongly on structure, the calculation of additive terms, which are

characteristic of every structural group in a molecule, can permit the theoretical calculation of the retention indices of any branched isomer. The additive terms can be calculated both by solving a system of equations and by comparison of the retention indices of selected compounds. The general application of the method to retention data taken from the literature is also possible. (Little-Battelle)
W73-14059

IDENTIFICATION OF ACTINOMYCES, ARACHNIA, BACTERIONEMA, ROTHIA, AND PROPIONIBACTERIUM SPECIES BY DEFINED IMMUNOFLUORESCENCE,
Central Hospital, Vasteras (Sweden). Dept. of Clinical Bacteriology.
K. Holmberg, and U. Forsum.
Applied Microbiology, Vol 25, No 5, p 834-843, May 1973. 4 tab, 53 ref.

Descriptors: *Pollutant identification, *Pathogenic bacteria, *Anaerobic bacteria, *Aerobic bacteria, Methodology, Isolation, Coliforms, Enteric bacteria, Classification.
Identifiers: *Actinomycetes, *Immunofluorescence, Characterization, *Serotypes, Sample preparation, Culturing techniques, Rothia dentocariosa, Bacterionema matruchotii, Actinomyces israelii, Actinomyces odontolyticus, Arachnia proprionica, Propionibacterium acnes, Propionibacterium avidum, Propionibacterium granulosum, Propionibacterium jensenii, Actinomyces viscosus, Actinomyces naeslundii, Serology, Immunoglobulin G, Fluorescein-isothiocyanate conjugated antisera.

Fractionated fluorescein-isothiocyanate (FITC)-conjugated immunoglobulin G (dye-to-protein ratio less than 10), produced against whole cells of Actinomyces spp, Arachnia, Bacterionema, Rothia, and Propionibacterium spp, give species-specific conjugates with controlled nonspecific staining reactions when appropriately diluted on the basis of their antibody content (10 mg/ml). Using this standardization in immunofluorescence, serotype-specific conjugates are also available after dilution for all serotypes of these organisms except for Actinomyces viscosus type 2, and Propionibacterium acnes type 1. Adequately adsorbed conjugates could be used to differentiate these serotypes from A. viscosus type 1 and P. acnes type 2, respectively. A serological classification in defined immunofluorescence corresponded to species and serotype designation proposed on the basis of other serological analysis and biochemical characteristics. This includes a separation in immunofluorescence of two serotypes of Propionibacterium acnes. The detection of certain actinomycetes of the family Actinomycetaceae and Propionibacterium species by the defined immunofluorescence in direct smears prepared from clinical specimens agreed to 88 percent with parallel culturing when including a prereduced (PRAS) medium technique for isolation. Qualitative studies revealed that single cells of these organisms could be specifically identified by immunofluorescence when admixed with morphologically similar bacteria and a large number of other contaminants. (Holoman-Battelle)
W73-14060

ESTIMATION OF GROWTH RATE FROM MITOTIC INDEX,
California Univ., Davis. Dept. of Bacteriology.
For primary bibliographic entry see Field 05B.
W73-14061

MICROFLORA OF SOIL AS VIEWED BY FREEZE-ETCHING,
Pennsylvania State Univ., University Park. Dept. of Microbiology
D. L. Balkwill, and L. E. Casida, Jr.
Journal of Bacteriology, Vol 114, No 3, p 1319-1327, June 1973. 14 fig, 4 tab, 20 ref.

Descriptors: *Soil microorganisms, Methodology, *Separation techniques, *Cytological studies, Clay loam, Silts, Evaluation, Electron microscopy, Soil microbiology, Pollutant identification.
Identifiers: *Freeze etching, *Transmission electron microscopy, Sample preparation, Cell morphology, Ultrastructure.

A study was conducted to determine whether the soil microbial population could be viewed and evaluated by transmission electron microscopy of replicas of frozen-etched cells physically removed from the soil. In addition simpler methods of cell separation were investigated as an alternative to those required for thin-section studies. Three samples of Hagerstown silty clay loam were obtained; the indigenous microflora of soil were released from the soil materials and concentrated without the occurrence of growth by use of a blending-simple centrifugation procedure. The cell concentrate was then frozen-etched and viewed by transmission electron microscopy. Criteria were established for detecting microbial cells among the residual soil debris. The freeze-etching of the soil cell concentrate provided results on cell size distributions in agreement with those obtained by thin sectioning. However, the blending-simple centrifugation procedure for cell release and concentration from soil allowed the observation of large cells (greater than or equal to 1.0 micron in diameter) which apparently are missed by the 'exhaustive centrifugal washing' cell separation-concentration procedure. The procedure of blending-simple centrifugation combined with the viewing of frozen-etched preparations allowed evaluations of the soil microflora for cellular diameters, length-width ratios, shapes, and structure. (Holoman-Battelle)
W73-14071

SELECTIVE POTASSIUM-SENSITIVE ELECTRODES BASED ON POTASSIUM TETRA--P-CHLOROPHENYLBORATE-POLY (VINYL CHLORIDE) SENSOR MEMBRANES,
University of Wales Inst. of Science and Tech., Cardiff.
J. E. W. Davies, G. J. Moody, W. M. Price, and J. D. R. Thomas.
Laboratory Practice, Vol 22, No 1, p 20-25, January 1973. 4 fig, 3 tab, 31 ref.

Descriptors: *Fabrication, *Selectivity, Laboratory equipment, Physical properties, Zeta potential, Stability, Gamma rays, Ion exchange, Electrical resistance, Calibrations, Chlorides, Nitrates, Sulfates, Calcium, Sodium, Hydrogen ion concentration.
Identifiers: *Performance evaluation, *Potassium PVC electrodes, *Ion selective electrodes, Sensors, Matrix membranes, Chemical interference, Ionic interference, Ion exchange electrodes, Selectivity coefficients, Membrane electrodes, Response time, Polyvinyl chloride, Potassium tetra-p-chlorophenylborate.

The fabrication and performances of three different sensor membranes comprising varying quantities of potassium tetra-p-chlorophenylborate ion exchanger, but incorporating a fixed quantity of poly (vinyl chloride) matrix, are discussed with regard to potential behavior in pure potassium solutions and in the presence of possible interferants. Response times, gamma radiation stabilities and operational life times are also discussed. Electrodes of comparable performance are obtained by coating platinum or silver with an ion exchanger/PVC mixture. (Holoman-Battelle)
W73-14075

INOCULATION TECHNIQUES--EFFECTS DUE TO QUALITY AND QUANTITY OF INOCULUM,
Hochschule fuer Bodenkulture, Vienna (Austria). Institut fuer Angewandte Mikrobiologie.
J. Meyrath, and G. Suchanek.
In: Methods in Microbiology, Volume 7B, Academic Press, New York, N.Y. 1972. p 159-209.

Descriptors: *Bacteria, *Cultures, *Fungi, *Yeasts, *Algae, Growth rates, Chlorella, Scenedesmus, Euglena, Anabaena, Laboratory equipment, Automation, Clostridium.
Identifiers: *Inocula, *Sample preparation, Storage, Bacillus subtilis, Bacillis megaterium, Staphylococcus aureus, Staphylococcus epidermidis, Sarcina lutea, Bordetella bronchiseptica, Corynebacterium, Candida albicans, Candiola stellatoidea, Saccharomyces cerevisiae, Candida tropicalis, Incubation, Clostridium botulinum, Mycelium radicis atrovirens, Mycelium radicis, Oidium, Fusarium, Collybia, Mucor rouxii, Trichoderma, Peniophora, Fomes, Aspergillus niger, Aspergillus terreus, Phytophthora infestans, Anacystis, Culture media, Penicillium chrysogenum, Penicillium notatum, Claviceps purpurea, Homogenization, Pasteurella tularensis, Bacillus globigii, Saccharomyces, Puccinia graminis, Uromyces phaseoli, Ophiobolus graminis, Histoplasma capsulatum, Agaricus bisporus, Aspergillus amstelodami, Aspergillus oryzae.

Discussions are presented on selection and standardization of inocula according to type of microorganism (bacteria, yeasts, filamentous fungi, microscopic algae), recovery and preparation of inocula, and effects of inoculum size and history of inoculum. (Little-Battelle)
W73-14077

THE FATTY ACIDS OF PSEUDOMONAS MULTIVORANS (PSEUDOMONAS CEPACIA) AND PSEUDOMONAS KINGII,
Center for Disease Control, Atlanta, Ga.
S. B. Samuels, C. W. Moss, and R. E. Weaver.
Journal of General Microbiology, Vol 74, No 2, p 275-279, February 1973. 2 tab, 27 ref.

Descriptors: *Pollutant identification, *Pseudomonas, Cultures.
Identifiers: *Gas liquid chromatography, Pseudomonas multivorans, Pseudomonas kingii, *Fatty acids.

The fatty acid compositions of three strains of Pseudomonas multivorans and three of P. kingii were determined by gas-liquid chromatography. The major fatty acids identified were 16:0, 16:1, 18:1, 3-OH 14:0, 3-OH 16:0 and cyclopropane acids 17 delta and 19 delta. The fatty acid compositions of these strains were similar to the acids identified in sixteen clinical isolates of the 'P. multivorans (P. cepacis)/P. kingii group'. These data support the current view that P. multivorans and P. kingii are identical species. (Little-Battelle)
W73-14078

INFLUENCE OF ABSORPTION COEFFICIENT ON REFLECTANCE OF WATER,
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
D. C. Look, A. L. Crosbie, B. F. Armaly, and H. F. Nelson.
Journal Water Pollution Control Federation, Vol 45, No 5, p 936-939, May 1973. 8 fig, 9 ref.

Descriptors: *Reflectance, *Remote sensing, Absorption, Light, Water, Equations, Mathematical studies, Infrared radiation, Refractivity.

To determine one effect that an absorption coefficient, represented by the imaginary portion of the index of refraction, has on reflectance, the computed reflectance for the real values of the index

of refraction was compared with the value of index of fraction equal to zero. The values of the imaginary portion of the index of refraction less than 0.02 have no effect on the reflectance from a water surface. It therefore can be assumed in computing reflectance that, except for the X absorption bands in the near infrared and all of the far infrared, water is a perfect nonconductor. (Little-Battelle)
W73-14082

TAXONOMY AND ECOLOGY OF THREE NEW SPECIES OF MONODIAMSA KIEFFER, WITH KEYS TO NEARCTIC AND PALAEARCTIC SPECIES OF THE GENUS (DIPTERA: CHIRONOMIDAE),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
O. A. Saether.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 665-679, May 1973. 3 fig, 23 ref.

Descriptors: *Systematics, *Speciation, *Midges, *Ecology, *Canada, Ecological distribution, Niches, Aquatic habitats, Growth stages, Aquatic insects, Lakes, Trophic level, Diptera, Spatial distribution, Profundal zone, Oligotrophy, Mesotrophy, Sands, Classification.
Identifiers: *Monodiamesa species *Nearctic species, *Palaearctic species, Insect morphology, Lake Winnipeg, Animal morphology, Sublittoral zone, Substrates, Chironomids.

Three Nearctic species of Monodiamesa are described: Monodiamesa depectinata sp.n. from imagines, pupae, and fourth- and third-instar larvae; and Monodiamesa prolilobata sp.n. from male imagines. A larva possibly belonging to M. prolilobata is described. These are the first records and descriptions of imagines, pupae, and larvae of the Nearctic and Palaearctic species of the genus. Monodiamesa depectinata occurs in the Laurentian Great Lakes area and in Lake Winnipeg, Manitoba. It was taken from sandy substrates in the lower littoral and the sublittoral zones of oligotrophic to mesotrophic lakes. Monodiamesa tuberculata occurs from the mainland of British Columbia through the prairie provinces and the Northwest Territories to the Laurentian Great Lakes. It was taken from the sublittoral and profundal zones of oligotrophic lakes and in some lakes is probably a glacial relict. Monodiamesa prolilobata, from west of the Rocky Mountains, probably covers the combined ecological niches of the two more easterly species. (Holoman-Battelle)
W73-14084

SELECTIVE ELECTRODE MEASUREMENT OF AMMONIA IN WATER AND WASTES,
National Environmental Research Center, Cincinnati, Ohio.
R. F. Thomas, and R. L. Booth.
Environmental Science and Technology, Vol 7, No 6, p 523-526, June 1973. 6 tab, 4 ref.

Descriptors: *Ammonia, *Water analysis, *Pollutant identification, Surface waters, Sewage, Saline water, Methodology, Chemical analysis, Wastes, Waste water (Pollution).
Identifiers: *Ammonia electrodes, Accuracy, Ion selective electrodes, Precision.

The use of an ammonia selective electrode in the determination of ammonia in surface waters, sewage samples, and saline waters was investigated. The electrode exhibited Nernstian behavior at a minimum concentration of 0.02 mg NH3-N/l in distilled water and 0.03 mg NH3-N/l in actual samples. When the values obtained for river and sewage samples were compared to those from the indophenol blue method on a Technicon AutoAnalyzer, the results differed by an average of 1.2 percent and 4.6 percent, respectively. On river water samples, the known addition method was tested against direct measurement (use of a calibration curve) and found to be acceptable. In addition to being inexpensive, the ammonia electrode offered the advantages of minimal sample and reagent preparation prior to analysis, wide concentration range, precision and accuracy comparable to accepted methods, and speed (maximum of 5 min per sample). (Holoman-Battelle)
W73-14085

SOLVENT CHARACTERIZATION BY GAS--LIQUID PARTITION COEFFICIENTS OF SELECTED SOLUTES,
Chemische Werke Huels A.G., Marl (West Germany).
For primary bibliographic entry see Field 05B.
W73-14088

A STUDY OF NUTRIENT VARIATIONS IN THE SURFACE AND MIXED LAYER OF MONTEREY BAY USING AUTOMATIC ANALYSIS TECHNIQUES,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05B.
W73-14090

A SIMPLE, OFF-LINE MASS SPECTRA DIGITIZER,
Technische Hogeschool, Eindhoven (Netherlands). Lab. of Instrumental Analysis.
For primary bibliographic entry see Field 07C.
W73-14093

AN IMPROVED BACTERIAL TEST SYSTEM FOR THE DETECTION AND CLASSIFICATION OF MUTAGENS AND CARCINOGENS,
California Univ., Berkeley. Dept. of Biochemistry.
B. N. Ames, F. D. Lee, and W. E. Durston.
Proceedings of the National Academy of Sciences, Vol 70, No 3, p 782-786, March 1973. 1 fig, 4 tab, 18 ref.

Descriptors: *Toxicity, *Bioassay, Salmonella, Pathogenic bacteria, Cultures.
Identifiers: *Salmonella typhimurium, *Mutagens, *Carcinogens, Sample preparation, Sensitivity.

A set of four strains of Salmonella typhimurium designed for detecting the various types of mutagens was described, and showed their utility in detecting a wide variety of carcinogens as mutagens. The lipopolysaccharide that normally coats these bacteria is a barrier to penetration of mutagens to the cell membrane. The set of tester strains has been improved by adding a mutation (rfa: deep rough) that results in a deficient lipopolysaccharide. The techniques for using these strains for detecting mutagens are presented and the tests are shown to be extremely sensitive and convenient. The specificity of frameshift mutagenesis is clarified. As adjuncts to the test with the four strains, a test is described that compares mutagenic killing in deep rough strains with and without DNA excision repair. Also described is a test using forward mutagenesis in a deep rough strain lacking excision repair. (Little-Battelle)
W73-14094

NEW AND RARE SPECIES OF SOME GREEN ALGAE FROM BANGLADESH,
Dacca Univ. (Pakistan). Dept. of Botany.
A. K. M. N. Islam.
Nova Hedwegia, Vol 23, No 4, p 655-677, 1972. 74 fig, 5 ref.

Descriptors: *Chlorophyta, *Aquatic algae, *Speciation, Classification, Systematics.
Identifiers: *Bangladesh, India, Temnogametum subtropicum, Mougeotia longiarticulata, Mougeotia longiarticulata fa. brevis, Mougeotia longiarticulata fa. nayarhatense, Mougeotia oedogonoides var, dacchense, Mougeotia pawhuskae, Mougeotia subellipsoidea, Mougeotia transeaui, Onychonema laeva var crenulata, Stigeoclonium geraldii, Stigeoclonium penicillatum

The following new species, varieties and formae have been described from Bangladesh together with Mougeotia pawhuskae Taft, and M transeaui Collins, namely, Stigeoclonium geraldii, sp. nov.; Stigeoclonium penicillatum, sp. nov.; Temnogametum subtropicum, sp. nov.; Mougeotia longiarticulata, sp. nov.; M. longiarticulata fa. brevis, fa. nov.; M. Longiarticulata fa. nayaharense, fa. nov.; Mougeotia oedogonoides var. dacchense, var. nov.; Mougeotia subellipsoidea, sp. nov.; Onychonema laeve var. crenulata var. nov. (Holoman-Battelle)
W73-14099

CHEMICAL AND SPECTROCHEMICAL ANALYSES OF SELECTED GROUND WATER IN COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02F.
W73-14102

HYDROGEOLOGIC DATA FOR THE QUINNIPIAC RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 07C.
W73-14112

RELATIONS AMONG RADIONUCLIDE CONTENT AND PHYSICAL, CHEMICAL, AND MINERAL CHARACTERISTICS OF COLUMBIA RIVER SEDIMENTS,
Geological Survey, Washington, D.C.
J. L. Glen, and R. O. Van Atta.
Available from GPO, Washington, D.C. 20402, Price $0.85. Geological Survey Professional Paper 433-M, 1973. 52 p, 20 fig, 25 tab, 63 ref.

Descriptors: *Radioisotopes, *Columbia River, *Sediments, *Washington, Cooling water, Nuclear reactors, Chemical analysis, Ion exchange, Cation exchange, Bottom sediments, Particle size, Correlation analysis, Nitrogen, Carbon, Mineralogy, Model studies, Methodology, Pollutant identification.

Radionuclides discussed were produced by neutron activation of elements in Columbia River water used to cool the nuclear reactors in the Hanford area near Pasco, Wash., prior to their final shutdown early in 1971. After return of the low-level radioactive cooling waters to the Columbia River, some radionuclides were attached to sediment particles, and some particles were incorporated in the streambed. Data are presented on radionuclides in size separates of streambed sediments and relations among radionuclide content, particle size, cation-exchange capacity, carbon and nitrogen content, and mineralogy. Two simplified qualitative models were used to aid interpretation of streambed-sediment and radionuclide data. One model assumes a fixed streambed and reversible uptake-release reactions that are dependent mostly on solute radionuclide concentrations. The second model involves sediment transport and considers irreversible uptake reactions that are dependent mostly on solute radionuclide concentrations. (Woodard-USGS)
W73-14114

STUDY OF THE QUALITY OF FORMATION WATERS FROM ELECTRIC LOGS IN THE SALT AREA, CALCUTTA,
Central Groundwater Board, Calcutta (India).
For primary bibliographic entry see Field 02K.
W73-14117

GEOCHEMISTRY OF THE GANGA RIVER WATER,
Geological Survey of India, Calcutta.

For primary bibliographic entry see Field 02K.
W73-14120

INVESTIGATION OF ENVIRONMENTAL INDICES FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE, PR 568/MMC 200,
MITRE Corp., McLean, Va.
E. L. Riley, S. Stryker, and E. A. Ward.
Available from NTIS, Springfield, Va 22151 as N73-10376, Price $3.00 printed copy; $1.45 microfiche. Interim Contract Report, February 1973. 138 p, 20 fig, 11 tab.

Descriptors: Water quality, *Air pollution, *Land use, *Aerial photography, *Satellites (Artificial), *Pennsylvania, Data processing, Digital computers, Mapping, Correlation analysis, Methodology, Remote sensing.
Identifiers: *Environmental indices, *ERTS, *Susquehanna River.

Land use, water quality, and air quality trends are being deduced from both ERTS-1 MSS imagery and computer compatible tapes (CCT's). The data analysis plan (Phase I) and the preliminary data analysis phase (Phase II) were concluded in January 1973. Progress made during the first 6 months of investigation to determine environmental indices from ERTS-1 data is described. The specific objectives of the investigation include: land use trends for two test areas in Pennsylvania over the August 1972--October 1973 time period; air quality/turbidity mesoscale trends over all of Pennsylvania for the August 1972-October 1973 time period; water quality along the Susquehanna River for one overflight date, October 11, 1972; specifications for an operational system using an ERTS-type system, and selected analysis software for water, land and air environmental indices calculation and display; and the possibility of automatic digital signature determination, i.e., the elimination of signature redeterminations for each imagery. (Woodard-USGS)
W73-14162

1972 RESULTS OF THE CONTINUED INTERCOMPARISONS OF METHODS FOR ANALYSES OF CESIUM, COBALT, SILVER AND OTHER RADIONUCLIDES SPONSORED BY IAEA. PART II: ANALYSIS OF DRIED SEAWEED SAMPLES COLLECTED BY BRITISH FISHERIES RADIOBIOLOGICAL LABORATORY,
Scripps Institution of Oceanography, La Jolla, Calif.
T. R. Folsom, V. F. Hodge, and K. M. Wong.
Available from the National Technical Information Service as T10-26206. Report May 31, 1972. 3 p, 1 tab, 2 ref. Contract No AEC AT (04-3)-34.

Descriptors: *Pollutant identification, *Radioactivity techniques, *Radioisotopes, *Marine plants.
Identifiers: Cs-134, Cs-137, Co-60, Ag-110m, Biological samples, Seaweeds.

Seaweed samples were analyzed by two-dimensional gamma spectrometry and by one dimensional analyses for Cs-134, Cs-137, Co-60, and Ag-110m. The results (in picocuries/gram dried seaweed) for three samples were 71.4-73.5 Cs-137; 10.2-10.8 Cs-134; 1.96-2.17 Co-60; and 0.1.17 Ag-110m. (Little-Battelle)
W73-14182

LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYETHYLENE FORMULATIONS OF CHLORPYRIFOS, DECEMBER 1971 - APRIL 1972,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
M. A. Lawson.
Available from the National Technical Information Service as AD-755 517. Report No. USAEHA-44-013-72/73, April 1972. 14 p, 4 fig, 3 ref, 2 append.

Descriptors: *Pesticide residues, *Water analysis, Separation techniques, Pesticides, Phosphothioate pesticides, Chlorinated hydrocarbon pesticides, *Gas chromatography, Statistical methods.
Identifiers: *Chlorpyrifos, Electron capture gas chromatography, Persistence.

Laboratory evaluations were conducted for 16 weeks to compare, under static conditions, residue levels maintained in water treated with three chlorinated polyethylene pellet formulations of chlorpyrifos (0,0-diethyl 0- (3,5,6-trichloro-2-pyridyl) phosphorothioate). All pellets were cylindrical in shape and had a specific gravity greater than 1.0. Each formulation was evaluated at dosages of 0.25, 0.5 and 1.0 ppm in one gallon glass jars containing three liters of distilled water. Treatments and controls were replicated three times. Water samples were removed from the jars weekly, partitioned with hexane, and subjected to electron capture gas chromatographic analysis to determine chlorpyrifos residues. Data were subjected to three way analysis of variance to determine effects of formulation, dosage, week after treatment, and the interactions thereof, on residues maintained in the water. Peak residue levels occurred within seven to ten weeks after treatment for all formulations at each dosage. A gradually decreasing trend in residues began after ten weeks for all formulations. Higher dosages resulted in significantly higher residue levels during each week of the study. There were no significant differences among the three formulations in the amount of residues maintained in the water during the 16 week test. (Little-Battelle)
W73-14184

OBSERVATIONS ON THE STRUCTURE OF SOME FORMS OF GOMPHONEMA PARVULUM KUTZ. II. THE INTERNAL ORGANIZATION,
Bristol Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-14187

CONTINUOUS CULTURE OF MARINE DIATOMS UNDER SILICATE LIMITATION. I. SYNCHRONIZED LIFE CYCLE OF SKELETONEMA COSTATUM,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-14188

MAJOR INORGANICS,
Alabama Univ., University.
T. L. Carlton, I. L. Smith, and J. V. Walters.
Journal Water Pollution Control Federation, Vol 45, No 6, p 979-982, June 1973. 18 ref.

Descriptors: *Water analysis, *Chemical analysis, *Reviews, *Analytical techniques, Calcium, Magnesium, Bromides, Iodides, Nitrites, Sulfates, Sulfides, Nitrates, Iron, Manganese, Fluorides, Photometry, Volumetric analysis, Colorimetry, Chlorides, Spectrophotometry, Potable water, Automation, Air, Air pollution, Soils, Soil analysis, Separation techniques, Solvent extractions.
Identifiers: Organomercury compounds, Cyanides, Chemical interference, Detection limits, Nephelometry, Ion selective electrodes, Brucine method, Atomic absorption spectrophotometry, Organic solvents, Natural waters.

This portion of the Water Pollution Control Federation's annual literature review covers new developments in analytical methods for alkali metals, chlorides, sulfates, sulfides, nitrates, iron, manganese, fluorides, and cyanides. (Little-Battelle)
W73-14189

TRACE INORGANICS,
Pittsburgh Univ., Pa.
J. B. Andelman.
Journal Water Pollution Control Federation, Vol 45, No 6, p 982-986, June 1973. 52 ref.

Descriptors: *Water analysis, *Chemical analysis, *Sea water, *Reviews, *Analytical techniques, Neutron activiation analysis, Mass spectrometry, Polarographic analysis, Photometry, Gas chromatography, Fluorometry, Gold, Waste water (Pollution), Groundwater, Estuaries, Potable water, Heavy metals, Solvents, Ion exchange, Chelation, Colorimetry, Iron, Suspended solids, Copper, Chemical precipitation, Sampling, Lead, Cadmium, Zinc, Manganese, Nickel, Algae, Aluminum, Bromides, Bromine, Chromium, Mercury, Solvent extractions, Bioindicators, Separation techniques, Molybdenum.
Identifiers: Atomic absorption spectrophotometry, Anodic stripping voltammetry, Sample preparation, Flame emission spectroscopy, Arc emission spectroscopy, Chemical interference, Detection limits, Preconcentration, Spark source mass spectometry, Sensitivity, Volatilization, Arsenic, Antimony, Proton activation analysis, Freeze drying, Precision, dc polarography, Pulse polarography, Coprecipitation, Barium, Biological samples, Natural waters, Deutrerium, Selenium.

Reveiw of the 1972 literature on analytical techniques for trace inorganics reveals that work has been done on atomic absorption spectrophotometry, neutron activation analysis, anaodic stripping voltammetry, polarography, flame and arc emission spectroscopy, spark source mass spectroscopy, photometry, gas chromatography, fluorometry, and in preparation of samples to improve results. (Little-Battelle)
W73-14190

DETERMINATION OF BENOMYL RESIDUES IN SOILS AND PLANT TISSUES BY HIGH--SPEED CATION EXCHANGE LIQUID CHROMATOGRAPHY,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Biochemicals Dept.
J. J. Kirkland, R. F. Holt, and H. L. Pease.
Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 368-371, May/June 1973. 3 fig, 4 tab, 8 ref.

Descriptors: *Soil analysis, *Plant tissues, *Soils, Pesticide residues, Carbamate pesticides, Loam, Silts, Sands, Separation techniques, Pollutant identification, Fungicides, Ion exchange, Peaches, Oranges, Apples, Pecans, Corn (Field), Carrots, Beans, Sugar beets.
Identifiers: *Benomyl, *Liquid chromatography, *Sample preparation, Biological samples, Chromatograms, Apricots, Cherries, Grapes, Celery, Cucumbers, Cantaloupe, Squash, Cation exchange liquid chromatography, Chemical recovery.

Benomyl (methyl 1- (butylcarbamoyl)-2-benzimidazolecarbamate) residues in soils and plant tissues may be determined by procedures using high-speed cation exchange liquid chromatography (1c). The method for soils is based on an acidic methanol extraction of the residues, which converts residual benomyl to MBC (methyl 2-benzimidazolecarbamate). After a liquid-liquid partitioning cleanup, the total benomyl and/or MBC residues are measured as MBC by high-speed liquid chromatography. Any 2-AB (2-aminobenzimidazole) present in the original sample is also extracted and simultaneously determined as a separate 1c peak. Recoveries of benomyl, MBC, and 2-AB from various types of soils average 92, 88, and 71 percent, respectively. The lower limit of sensitivity of the method is 0.05 ppm for each of these components. The method for plant tissues is based on ethyl acetate extraction of the residue followed by liquid-liquid partitioning cleanup and liquid chromatographic measurement. Recoveries and limit of sensitivity of this method for plant tissues were essentially that found for soils. (Little-Battelle)
W73-14195

A PROBE FOR SAMPLING MIRE WATERS FOR CHEMICAL AND GAS ANALYSIS,
Nottingham Univ. (England). Dept. of Botany.
R. J. Summerfield.
Plant and Soil, Vol 38, No 2, p 469-472, April 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Water sampling, *Methodology, *Mechanical equipment, Chemical analysis, Dissolved oxygen, Construction, Operation and Maintenance, On-site investigations, Water analysis, Gases.
Identifiers: *Mire waters, Reliability.

In order to carry out accurate analysis of the oxygen dissolved in mire waters a method was devised for withdrawing water samples, relatively free from particulate matter, without contamination by atmospheric oxygen. A probe is introduced into the substrate, a few minutes are allowed for the collection chamber to become filled with mire water, and the sample is pumped out into a collecting bottle for analysis. The depth of insertion of the probe may be altered, samples may therefore be collected from different rooting zones for chemical or dissolved gas analysis. The construction and operation of the probe are described. (Holoman-Battelle)
W73-14198

ANTICATALYTIC MICRODETERMINATION OF MERCURY USING CERIUM-ARSENITE REACTION,
Windsor Univ. (Ontario). Dept. of Chemistry.
P. J. Ke, and R. J. Thibert.
Mikrochimica Acta, No 1, p 15-24, 1973. 2 fig, 3 tab, 21 ref.

Descriptors: *Mercury, *Pollutant identification, *Chemical reactions, *Aqueous solutions, Heavy metals, Methodology, Cations, Hydrogen ion concentration, Copper, Chromium, Bromides, Anions, Iodides, Inhibition, Chemical analysis.
Identifiers: *Cerium-arsenite reaction, *Anticatalytic kinetic method, Errors, Chemical recovery, Precision, Accuracy, Reliability, Reproducibility, Detection limits, Chemical interference, Ionic interference, Silver.

An anticatalytic kinetic method, based on the decreased rate of the reaction between Ce (IV) and As (III), was developed for the determination of mercury. The change in reaction rate due to inhibition by mercury was measured spectrophotometrically at 275 nm. The presence of the following ions in the reaction mixture (10 ml) did not interfere at a level of 0.1 mg: Na, K, ammonium, Ba, Mg, chloride, nitrate, sulfate, cyanide, and bicarbonate. Cu, Cr and bromide which catalyze the reaction between Ce and arsenite, yielded 10-15 percent negative error at 0.1-microgram level, and Ag gave serious interference. An increase of 10-15 percent recovery of Hg was observed with more than 50 micrograms of Ni (II), Co (II), Fe (III), and Zn (II). The As (III)/Ce (IV) reaction is extremely sensitive to iodide ions, and even with only 5 ng of iodide present in the reaction system, an error of 50 percent in the determination was observed for a sample containing 0.1 microgram of mercury. Amounts of mercury in the range 0.04 - 0.20 microgram were determined with an overall error of less than 5 percent at a reaction time of 25 minutes. (Holoman-Battelle)
W73-14200

5B. Sources of Pollution

ECOLOGICAL IMPLICATIONS OF DIMETHYL MERCURY IN AN AQUATIC FOOD CHAIN,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05C.
W73-13657

AN INVESTIGATION OF THE CAUSE AND EFFECT OF EUTROPHICATION IN LONG LAKE, WASHINGTON,
Eastern Washington State Coll. Cheney Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-13658

BIOLOGICAL IMPACT OF COMBINED METALLIC AND ORGANIC POLLUTION IN THE COEUR D'ALENE-SPOKANE RIVER DRAINAGE SYSTEM,
Washington State Univ., Pullman.
W. H. Funk, F. W. Rabe, R. Filby, J. I. Parker, and J. E. Winner.
Available from the National Technical Information Service as PB-222 946, $5.50 in paper copy, $1.45 in microfiche. Joint Project Completion Report, June 30, 1973. 187 p, 56 fig, 31 tab, 84 ref. OWRR B-044-WASH (1), B-015-IDA (3). 14-31-001-3664, 14-01-001-3576.

Descriptors: Water quality, *Heavy metals, Benthos, Aquatic environment, Food chain, Neutron activation analysis, Spectrophotometry, *Algae, *Bioassay, *Phytoplankton, Sediments, Trace elements, *Washington, Metals.
Identifiers: Coeur d'Alene River, Coeur d'Alene Lake, Spokane River, Atomic absorption spectroscopy.

Biological effects of metallic and organic pollution in the Coeur d'Alene - Spokane River Lake drainage system were investigated. Water quality data show heavy inflows of nutrients during late spring into Coeur d'Alene Lake from the St. Joe and Coeur d'Alene Rivers and Plummer Creek. Although no water devoid of dissolved oxygen has been measured, 2-4 mg/l have been measured in the southern portion of the lake. Phytoplankton productivity measurements and bottom organism identification and enumeration have shown that the lake functions at several trophic levels. High metal concentrations (1000-7000 mg/kg Zn) in the bottom sediments of the middle and northern portions of the lake did not appear to substantially affect distribution of benthic chironomids or oligochaetes. Lake sediment cores taken across the delta region of the Coeur d'Alene River penetrated through the regions of high metallic concentration and allowed an average sediment deposition rate to be calculated. Algal toxicity tests showed the amount of Zn normally present in the Coeur d'Alene Lake and River and the Spokane River to be inhibitory to the algal test organism Selanastrum capricornutum. The water quality of the Spokane River was of good to excellent quality in all parameters tested except for high metallic content, especially Zn. Activation and atomic absorption analysis of the metallic content in tissues of the organisms in the Spokane River indicated that algae were the prime concentrators of Zn, Cd, Pb, Hg, Fe, and Mn. Algae and detritus consumers reflected high metallic concentrations. Analysis of fish tissues showed a considerably lower concentration of metals than the aquatic plants, insects, or algae. The fish, when collected, did not appear to be under stress leading to the belief that most of the metals--although present in relatively high concentrations in the tissues of the organisms tested-must be in a relatively innocuous state.
W73-13659

HEAT AND WATER VAPOR EXCHANGE BETWEEN WATER SURFACE AND ATMOSPHERE,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D.
W73-13663

STRIP MINING, AN ANNOTATED BIBLIOGRAPHY,
R. F. Munn.
West Virginia University Library, Morgantown, 1973. 110 p

Descriptors: *Coal mines, *Strip mines, *Bibliographies, *Publications, Documentation, Abstracts, Water pollution sources, Pollution abatement, Mine wastes, Environmental effects, Legal aspects, Economics, Appalachian Mountain Region, United States

This annotated bibliography contains 611 references to aid those interested in the history, development, and problems associated with the strip mining of coal in the United States. References to other applications of strip mining--iron ore, bauxite, etc.--have been excluded as have references to operations outside the United States. The increasing energy requirements of the country and the shortage of other fuels make nationwide abolition of stripping seem unlikely in the near future. Thus disputes over practices and policies will continue. There will doubtless be some variations in both theme and tone. For example, much of the stripping may shift from Appalachia to the Western Plains. However, the basic concerns--economic, political and philosophical--will remain. (Woodard-USGS)
W73-13709

AN EVALUATION OF SOIL WARMING FOR INCREASED CROP PRODUCTION,
Oregon State Univ., Corvallis. Dept. of Soil Science.
A. Rykbost.
Ph D Thesis, June 1973. 275 p, 25 fig, 73 tab, 92 ref. OWRR B-019-ORE (2) and B-028-ORE (1).

Descriptors: Soils, Crop production, *Soil temperature, Cooling water, *Soil water, Oregon, Irrigation systems, Thermal pollution.
Identifiers: *Soil warming, *Thermal discharge, *Waste heat.

Objectives were: (1) to determine the effect, if any, of buried line heat sources on air temperatures within a crop canopy; (2) to determine the extent to which soil temperature can be elevated with buried line heat sources maintained at various temperatures; (3) to establish the effect of subsurface heating on soil water regimes and to evaluate a subsurface irrigation system as a means of maintaining high soil water content and hence high rates of heat transfer in the vicinity of heat sources; (4) to evaluate a theoretical model for prediction of energy dissipation rates; (5) to establish the yield response to soil warming for numerous crops; and (6) to evaluate the influence of subsurface heating on soil and air temperatures and crop production in a wood frame, plastic covered greenhouse. Results suggest that soil warming with condenser cooling waters from thermal power plants is feasible. Additional information is needed to evaluate the economic and engineering aspects of a soil warming system.
W73-13710

SAPROBIC SUCCESSIONS,
For primary bibliographic entry see Field 05C.
W73-13724

REMOTE SENSING STUDY OF THERMAL DISCHARGES TO LAKE MICHIGAN, ILLINOIS--INDIANA-MICHIGAN.
National Field Investigations Center-Denver, Colo.

Available from NTIS, Springfield, Va. 22151 as PB-214 407, Price $3.00 printed copy; $1.45 microfiche. Environmental Protection Agency Publication, October, 1972. 30 p, 16 fig.

Descriptors: *Thermal pollution, *Electric powerplants, *Lake Michigan, Remote sensing, Aerial photography, Data collections, Water temperature, Water pollution sources, Path of pollutants,

Pollution abatement, Federal Government, Illinois, Indiana, Michigan.

An aerial reconnaissance study of thermal discharges was conducted along the shoreline of Lake Michigan from South Haven, michigan, through Waukegan, Illinois. The flights were carried out during the afternoon hours on October 17, 1972 and October 19, 1972. Six powerplants were in operation during the course of this study. Thermal data were obtained at a distance of 1,000 feet from the discharge position. At the Palisades plant, the temperature increase at 1000 ft was 14.3 deg F (12.2 deg F at 2,000 feet); and at Waukegan the increase at 1000 ft was 16.1 deg F (3.4 deg F at 2,000 feet). The maximum allowable temperature recommended for October is 65 deg F. The Palisades powerplant was in violation of this 65 deg F temperature value at the 1,000 ft point. (Woodard-USGS)
W73-13747

IMPLICATIONS OF WASTE TREATMENT PROCESSES AND ARCTIC RECEIVING WATERS,
Alaska Univ., College. Inst. of Water Resources.
R. S. Murphy, and J. K. Greenwood.
In: Proceedings of lst International Conference on Port and Ocean Engineering under Arctic Conditions, Vol II, p 909-915, 1971, Technical University of Norway, Oslo. 1 fig, 15 ref.

Descriptors: *Water pollution sources, *Oil spills, *Alaska, *Arctic, *Waste treatment, Human population, Projections, Ecosystems, Ecology, Environmental effects, Oil industry, Construction, Pipelines, Sediment transport, Water quality, Water pollution control.

The emerging status of North America's Arctic and sub-Arctic is continuing to cause national and international debates on possible environmental degradation to a fragile and rare ecosystem. The most frequently heard fear centers around oil spills (petroleum of course, being the prime reason for most existing activity in the Far North). A close second is the concern about distrubing the protective tundra overlying the permafrost and the ensuing erosion, failures to manmade structures, and alteration of natural migration paths and breeding areas of various arctic and subarctic fauna. Some of the problems of waste treatment and disposal are described in arctic Alaska, mainly the Prudhoe Bay region. Projected populations for the whole North Slope are described. Communities with populations greater than 1,000 to 2,000 persons will be rare, and total population will probably not exceed 10,000 on the North Slope. Greater populations than this may be present for short periods during construction activities, however. (Woodard-USGS)
W73-13748

VERTICAL DISTRIBUTION OF DISSOLVED TRACE ELEMENTS IN BLACK SEA WATER (O VERTIKAL'NOM RASPREDELENII MIKROELEMENTOV, RASTVORENNYKH V VODE CHERNOGO MORYA),
Z. A. Vinogradova, N. Z. Yeremina, and G. M. Kogan.
Akademiya Nauk SSSR Doklady, Vol 204, No 3, p 704-706, 1972. 1 fig, 1 tab, 10 ref.

Descriptors: *Geochemistry, *Water chemistry, *Trace elements, *Solutes, *Sea water, Metals, Organic matter, Carbon, Water sampling, Depth.
Identifiers: USSR, *Black Sea, Vanadium, Tin.

Hydrochemical investigations and, in particular, study of the concentration of biologically active chemical elements are helpful in determining various aspects of the productivity and dynamics of different water types. To study vertical distribution of trace elements in the Black Sea, samples of sea water were collected from standard depths in bottles made of vinyl plastic. Between the surface and a depth of 2.5 cm, samples were collected in a flat Plexiglas container. Vertical distribution of dissolved iron, manganese, and copper in the sea water is extremely nonuniform, while the concentration of nickel, cobalt, and vanadium varies little between the surface and a depth of 2,000 m. Variations in the average concentration of Fe, Cu, Mn, V, Ni, Co, and organic carbon with depth are graphed, and concentrations of Cu, Sn, Mn, Fe, V, Co, Ni, Al, Mo, and Pb (in micrograms/liter) are tabulated. (Josefson-USGS)
W73-13754

AMINO ACIDS IN ORGANIC MATTER FROM SUSPENSIONS, WATER, SEDIMENTS, AND PORE SOLUTIONS IN THE BLACK SEA (AMINOKISLOTNYY SOSTAV ORGANICHESKOGO VESHCHESTVA VZVESI, VODY, OSADKOV I GRUNTOVYKH RASTVOROV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
N. D. Starikova, and L. I. Korzhikova.
Akademiya Nauk SSSR Doklady, Vol 204, No 1, p 203-206, 1972. 3 fig, 2 tab, 6 ref.

Descriptors: *Amino acids, *Organic matter, *Suspended solids, *Sediments, *Pore water, Geochemistry, Biochemistry, Sampling.
Identifiers: USSR, *Black Sea.

Amino acid concentrations in suspensions, water, sediments, and pore solutions were investigated in the Black Sea in the autumn of 1968. Samples of water and suspended material were taken at two deep-water stations at depths of 0, 15, and 100 m in the oxygen zone and at depths of 200, 1,000 and 2,000 m in the hydrogen sulfide zone. Surface sediment samples were collected at 7 stations along the Gelendzhik-Sinop profile. The amino acid concentration in suspended material varies between 19 and 91 micrograms/liter, averaging 33.0 micrograms/liter. The concentration of amino acids dissolved in water ranges from 111 to 643 micrograms/liter and averages 256.0 micrograms/liter. The amino acid concentration in surface sediments varies between 378 and 6,440 micrograms per gram of dry material, averaging 1,658 micrograms/g. High concentrations of amino acids are found in deep-sea sediments (1,950 m, 2,180 m), while lower concentrations are found in shallow-water sediments (92 m, 100 m). The concentration of amino acids in pore solutions ranges from 1,289 to 6,000 micrograms/liter and averages 3,100 micrograms/liter. Amino acids are grouped according to their chemical nature (acid, basic, neutral, aromatic, and sulfur-bearing amino acids), and their concentrations in suspensions, water sediments, and pore solutions (in percent) are tabulated. (Josefson-USGS)
W73-13756

LIMITATIONS OF THE ELECTRICAL RESISTIVITY METHOD FOR DETECTING LANDFILL LEACHATE IN ALLUVIAL DEPOSITS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
G. E. Klefstad.
M Sc Thesis, 1973. 106 p, 25 fig, 6 tab, 40 ref, 2 append. OWRR A-047-1A (1).

Descriptors: *Water pollution sources, *Landfills, *Iowa, *Sanitary engineering, *Water quality, Groundwater, Analytical techniques, Piezometers, Geology, Resistivity, Physical properties, Geophysics, Chemical analysis.

Sanitary landfills situated on Iowa floodplains were investigated. Five sites were chosen to provide a range in landfill size and age as well as a variation in the average grain size of the alluvial deposits in which the landfills are situated. The five study sites are located in or near the Iowa cities of Ames, Council Bluffs, Cedar Falls, Des Moines, and Mason City. The resistivity study was conducted employing the Wenner electrode configuration. Piezometers were installed and groundwater samples were collected and analyzed on a monthly basis. Some landfill sites proved better suited for electrical investigations than others. In the cases of the Omaha and the Des Moines studies, the landfills were located too close to the river to establish an adequate station network not only in the contaminated zone but also in the uncontaminated areas, so that a comparison could not be made. In the Spring Lake and the Des Moines studies, problems of urban development and buried conductors were encountered which complicated the interpretation of the resistivity results. The Mason City study indicated that the degree of contamination present at a site also plays an important role, that is, a chloride concentration of 360 ppm can be detected but a value of 85 ppm cannot. (Woodard-USGS)
W73-13758

ON THE USE OF MATERIAL BALANCES FOR THE ASSESSMENT OF SELF-PURIFICATION CAPACITY IN INLAND WATERS, LAKE PAIJANNE AS AN EXAMPLE,
For primary bibliographic entry see Field 05C.
W73-13779

DISTRIBUTION OF EPILITHIC ALGAE ON UPPER REACHES OF YOSHI-GAWA RIVER: III. ECOLOGICAL STUDIES OF EPILITHIC ALGAE IN WINTER IN KONGO-GAWA RIVER, MITSUISHI-CHO, OKAYAMA PREFECTURE, (IN JAPANESE),
I. Imada.
Bull Jap Soc Phycol. Vol 20, No 1, p 23-29. 1972. Illus. (English summary).
Identifiers: *Algae (Epilithic), Bacillariophyceae, Chlorophyceae, Cyanophyceae, Distribution patterns, Ecological studies, *Japan (Kongo-Gawa River), Rivers, Temperature, Winter, Yoshii-Gawa River.

Observations made on the ecological studies of epilithic algae in the Kongo-Gawa River, Mitsuishi-cho, Okayama Prefecture, Japan, in January, 1968 are discussed. Distribution of epilithic algae, water temperature, dissolved oxygen, KMnO4-consumption, and pH-value were measured at 7 stations. The water temperature was 6.4 approximately 9.0C the dissolved oxygen was 12.42 ml/1 approximately 16.52 ml/1, KMnO4-consumption was 8.04 mg/1 approximately 26.53 mg/l. The pH was 7.15 approximately 7.50. Bacillariophyceae always dominate throughout all stations about 47.6% (st. E) 84.5% (st. C). The maximum cell number of Bacillariophyceae was 29,300/mm2 at station A, and the minimum was 4600/mm2 at station B. Cyanophyceae and Chlorophyceae were inferior in the cell number at all stations, about 25.4% and 19.99%, respectively. The cell number of the Cyanophyceae varied 2700 approximately 7300/mm2, the maximum cell number was 7300/mm2 at station D, and minimum cell number was 2700/mm2 at station B. The cell number of the Chlorophyceae varied 700 approximately 5800/mm2, the maximum cell numbers was 5800/mm2 at station A, and minimum cell number was 700/mm2 at station C. The quantity of Cyanophyceae was larger downstream in the Kongo-Gawa River, but that of Bacillariophyceae was fewer.--Copyright 1973, Biological Abstracts, Inc.
W73-13814

EFFECT OF WASTE DISCHARGES INTO A SILT-LADEN ESTUARY, A CASE STUDY OF COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-13815

PESTICIDE LEVELS IN WATER AND WILDLIFE OF REELFOOT LAKE, TENNESSEE,
Tennessee Univ., Martin. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-13820

PLUME TEMPERATURE MEASUREMENTS OF SHALLOW, SUBMERGED MODEL DISCHARGES WITH CURRENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg. National Thermal Pollution Research Program.
L. D. Winiarski, and J. P. Chasse.
Available from the National Technical Information Service as PB-223 014, $5.00 in paper copy, $1.45 in microfiche. Environmental Protection Technology Series Report No. 2, EPA-660/2-73-001, January 1973. 54 p, 29 fig, 6 tab, 1 ref. Program Element 1 B 1032.

Descriptors: *Water cooling, *Jet diffusion, *Diffusers, Mixing, Dilutation, Dispersion, Thermal pollution, Heated water, Water temperature, Thermal water, Entrainment, *Plumes, *Model studies.
Identifiers: Shallow discharge, Towing channel.

Laboratory studies were conducted with a shallow-submerged thermal discharge model in a flowing ambient stream. Plume behavior, characterized by excess temperature, trajectory, and width, was observed to determine the qualitative effects of the discharge angle, Froude number, relative stream velocity, and turbulence in the ambient water. Increasing the angle of discharge in a vertical plane parallel to the direction of stream flow caused increased dilution and lower temperatures along the trajectory. Jets of higher Froude number diluted less than those of lower Froude number for the same discharge angle and relative stream velocity. With no turbulence in the ambient stream, dilution was increased by a reduction in the ambient stream velocity. However, in a turbulent stream, dilution was decreased by a reduction in the ambient velocity. (EPA)
W73-13821

POLLUTION LOADS IN PERCOLATE WATER FROM SURFACE SPREAD SWINE WASTES,
Maryland Univ., College Park. Dept. of Agricultural Engineering.
H. L. Brodie.
Available from the National Technical Information Service as PB-223 015, $3.00 in paper copy, $1.45 in microfiche. Water Resources Research Center, University of Maryland, College Park, Technical Report No. 13, October 1972. 25 p, 1 fig, 6 tab, 21 ref. OWRR A-019-MO (1).

Descriptors: *Groundwater pollution, *Farm wastes, *Hogs, *Percolation, *Flood irrigation, *Waste disposal, Nitrogen, Chemical oxygen demand, Phosphates, Chlorides, Sulfates, Maryland.

The effectiveness of the soil as a receptor for the concentrations of nutrients and organics in periodic high rate flood applications of liquid swine wastes was investigated. A lysimeter was used for collecting soil percolate waters after flood application of liquid waste or tap water and after rainfall in order to test the soil as a high-rate physical and biological filter for liquid swine wastes. Samples of the saturated flow were removed at depths of 25, 50, and 75 centimeters in the profile and tested for concentrations of chemical oxygen demand, ammonium nitrogen, chloride, total phosphate, and sulfate. The concentrations were compared with the concentrations of the applied liquid to determine net decrease of concentration through the soil profile. Results indicated that flood irrigation can lead to groundwater pollution. (Marquard-East Central)
W73-13822

PERSISTENCE OF MANURE PHOSPHORUS AVAILABILITY IN CALCAREOUS SOIL,
Arizona Univ., Tuscon. Dept. of Soils, Water and Engineering.
J. L. Abbott, and T. C. Tucker
Soil Science Society of America Proceedings, Vol 37, No 1, p 60-63, January-February, 1973. 1 fig, 5 tab, 11 ref.

Descriptors: *Fertility, *Waste disposal, *Phosphorus, Nitrogen, *Calcareous soils, Cotton, Barley, Alfalfa, Arizona, Cycling nutrients
Identifiers: *Plant nutrition, Pollution control

The contribution of P from manure to Calcareous soils was studied on a Mohave clay loam. Manure treatments involved different amounts and frequency of manure application, and were split with nitrogen variables of 0, 84, and 168 kg/ha. Total P content of manures ranged from 3-5 kg per metric ton during the course of study. The results indicated that manure is an effective source of P as illustrated by the increased P content of cotton, barley, and alfalfa tissue as well as soil analysis. Manuring at 2 or 3 year intervals at 22 metric tons/ha assures adequate P availability, while P availability from phosphate fertilizers may be negligible over the same period. (Marquard-East Central)
W73-13823

CHARACTERISTICS OF CATTLE FEEDLOT SURFACE RUNOFF,
J. C. Ward, E. M. Jex, and T. E. Norton.
Typescript, (1970), 4 p, 1 tab.

Descriptors: *Feed lots, *Surface runoff, Dissolved solids, Biochemical oxygen demand, *Cattle, Conductivity, Hydrogen ion concentration, Water pollution sources.
Identifiers: Volatile solids, Van't Hoff-Arrhenius relationship, Onsager equation.

This study has two parts: (1) the complete mixing of cattle manure with distilled water to obtain characteristics of the manure, and (2) examination of surface runoff samples from cattle feedlots in order to ascertain their characteristics as a function of several hydrologic variables. In part 1, the supernatant from samples was examined for conductivity, pH, dissolved solids, volatile solids, and BOD. In part 2, a simulated rainfall apparatus was utilized to obtain runoff samples. These samples were analyzed on the spot and in the laboratory for ultimate BOD, conductivity, alkalinity, settleable suspended solids, volatile solids, and dissolved solids. (Dudley-East Central)
W73-13833

IDENTIFICATION OF BEEF CATTLE FEEDLOT ODORS,
Texas Tech Univ., Lubbock. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W73-13836

AGRICULTURAL WASTES--A MANAGEMENT PROBLEM,
Ohio State Univ., Columbus.
E. P. Taiganides.
In: Frontiers in Conservation, Proceedings, 24th Annual Meeting, Soil Conservation Society of America, Colorado State University, Fort Collins, August 10-13, 1969, p 90-92, (1969) 2 fig.

Descriptors: *Farm wastes, *Pollution, *Waste disposal, Subsidy, Chemicals, Confinement pens, *Municipal wastes, *Management.
Identifiers: Urban-rural interface.

Our nation's fundamental problems are poverty, pollution, population, and politics. It is necessary to have integrated and coordinated management of resources at the urban-rural interface to prevent environmental pollution. Although particular attention is given to waste management from animal confinement units, all production systems create waste. Regardless of the source urban or rural, all of these wastes are either organic or inorganic and either solid or liquid. The wastes from all rural and urban areas must be considered as a regional problem whose solution will need the cooperation of the agricultural, industrial, urban, and other political sectors of the nation. A need exists to demonstrate the benefits of cooperation between the rural and urban sectors with an integrated regional scheme of using agricultural soils and nonproductive rural land for waste disposal. (Dudley-East Central)
W73-13838

LIQUID WASTE SEEPS FROM ONE BASIN TO ANOTHER.
For primary bibliographic entry see Field 05D
W73-13845

SALMONELLA IN THE LAYING HEN. I. SALMONELLA RECOVERY FROM VISCERA, FECES AND EGGS FOLLOWING ORAL INOCULATION,
Louisiana State Univ., Baton Rouge. Dept. of Poultry Science.
N. A. Cox, B. H. Davis, A. B. Watts, and A. R. Colmer
Poultry Science, Vol 52, No 2, p 661-666, March, 1973. 3 tab, 21 ref.

Descriptors: *Salmonella, *Farm wastes, *Poultry, Bacteria, Diseases, Analysis, Tissues, *Contamination, Eggs.
Identifiers: Inoculation, Seftenberg, Thompson, Typhimurium.

A study was made to determine the fate of Salmonella organisms after ingestion by the laying hen. Three species of Salmonella were used, i.e., senftenberg, thompson and typhimurium. Approximately one million cells of each species were introduced into the crop of 12 White Leghorn type laying hens for 10 days. The trials involving each species were carried out consecutively with thorough disinfection of equipment between trials. From each hen, feces and eggs were analyzed daily for Salmonella for the 10 day period. At the end of the 10 day trial a sample of blood was drawn from each hen for Salmonella analysis. In addition, the hens were slaughtered and a sample of the ovaries, kidneys, heart, liver and lungs was aseptically removed for analysis. Approximately 25% of the fecal samples contained the species of Salmonella under study. The percentage of positive recoveries from egg shells was less than 10% for all three species studied. Among the egg contents examined for all three species, only one egg yielded a positive recovery. All tissue samples were negative. It was concluded that there was no contamination of body tissues even after continuous ingestion of large doses of Salmonella organisms. Neither was there a problem of egg meat contamination among intact eggs. (East Central)
W73-13852

NUTRITIONAL INTERRELATIONSHIPS OF DIETARY CALCIUM, PHOSPHORUS, AND MAGNESIUM IN SHEEP,
Florida Univ., Gainesville. Dept. of Animal Science.
C. F. Chicco, C. B. Ammerman, J. P. Feaster, and B. G. Dunavant.
Journal of Animal Science, Vol 36, No 5, p 986-993, May 1973, 1 fig, 6 tab, 28 ref.

Descriptors: *Calcium, *Phorphorus, *Magnesium, *Sheep, Metabolism.
Identifiers: *Nutritional interrelationships, Plasma, Fecal excretion, Basal diet, Femur deposition.

Four experiments were conducted with 116 wethers to study dietary interrelationships of calcium, phosphorus and magnesium. Including all experiments dietary levels varied as follows: calcium 0.13 to 0.78%, phosphorus 0.12 to 0.36%, and magnesium 500 to 7,750 ppm. Treatment effects on fecal, urinary, plasma and bone mineral levels were observed. In two experiments, the utilization of oral Ca and P was measured. High dietary calcium increased calcium in plasma (P<.05) and feces (P<.10 to P<.01) and decreased magnesium in bone and plasma (P<.05). High calcium increased fecal phosphorus (P<.01) and tended to reduce plasma phosphorus. Excess dietary magnesium reduced plasma calcium (P<.01), appeared to increased fecal loss of calcium but had no effect on bone calcium. High magnesium increased the level of magnesium in urine (P<.01), plasma (P<.05 to P<.01) and bone (P<.05 to P<.01). High dietary phosphorus with a Ca:P ratio of 1:3 increased fecal calcium (P<.05), but, at a higher level of calcium with a Ca:P ratio of 1:1, phosphorus enhanced calcium retention. Supplemental phosphorus increased plasms phosphorus and reduced plasma calcium (P<.01). (East Central)
W73-13853

CARBON MONOXIDE IN THE BIOSPHERE: CO EMISSION BY FRESH-WATER ALGAE,
Argonne National Lab., Ill.
H. L. Crespi, D. Huff, H. F. DaBoll, and J. J. Katz.
Available from the National Technical Information Service as PB-213 914. Final Report, October 1972. 26 p, 10 fig, 2 tab, 18 ref.

Descriptors: *Aquatic algae, *Air pollution, Biochemistry, Photosynthesis, Pigments, Synthesis, Degradation (Decomposition), Chlorophyll, Cyanophyta, Chlorophyta, Chlorella, Scenedesmus, Carbon dioxide.
Identifiers: *Carbon monoxide, Phormidium luridum, Fremyella diplosiphon, Synechococcus vividus, Chlorella vulgaris, Scenedesmus obliquus.

The described experiments indicate that biogenesis, and, particularly degradation, of photosynthetic pigments are large and previously unsuspected contributors to carbon monoxide in atmosphere. Carbon monoxide can be produced by algae and higher plants by at least two pathways. The prosthetic groups of the two characteristic photosynthetic pigments of blue-green algae, phycocyanin and phycoerythrin, result from oxidation of a tetrapyrrole macronucleus such as chlorophyll. The chemistry is probably similar to conversion of heme of hemoglobin in animals to bile pigments, a process producing one molecule of CO for each molecule of heme transformed to bile pigment. Chemical relationship between chlorophyll and algal bilins is very similar to that of heme and bile pigment. Production of CO by blue-green algae by this process is strongly species specific. Degradation of chlorophyll in dying plant material is a second way for plants to produce CO, for chlorophyll degradation might also follow a course analogous to heme degradation. These data may be interpreted as: biosynthesis of bilinoid pigments in blue-green algae yields CO; degradation of chlorophyll in both blue-green and green algae yields CO; and additional unknown source of CO exists in plants. (Jones-Wisconsin)
W73-13903

APPLICATION OF THE OXYGEN METHOD IN ALGOTOXIC INVESTIGATIONS,
For primary bibliographic entry see Field 05C.
W73-13906

COMPUTER STUDIES OF ESTUARY WATER QUALITY,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
D. O. Hodgins, and M. C. Quick.
In: Proceedings of the 13th Coastal Engineering Conference, July 10-14, 1972, Vancouver, B.C., p 2327-2338 (1972). 8 fig, 3 ref.

Descriptors: *Computer models, *Estuaries, *Water quality, Computer programs, Dispersion, Convection, *Canada, Seasonal, Tides, Stratification, Saline water intrusion, *Path of pollutants.
Identifiers: *Fraser River Estuary (Canada), Pitt Lake (Canada), Straight of Georgia (Canada).

This study determines and traces the water movements resulting from tide and river flows in the Fraser River estuary, Canada. These water movements are calculated by determining numerical solutions of the hydrodynamic equations. The solutions are transferred to a convection and diffusion computer sub-model as the basis for determining water quality conditions resulting from effluent discharges entering the system at known points. The method is used to determine the convection and diffusion of the conservative pollutants. The Fraser River is one of the few remaining major salmon rivers and supports a major portion of both the Canadian and the United States salmon fishing industry. At the present time it is relatively undeveloped and flows are only slightly regulated. The basic program is a Dronkers type one-dimensional hydrodynamic model, interfaced with a model of salt water intrusion in the seaward reach. The salt wedge analysis reveals the nature of the interfacial stress which is not a function of velocity or velocity squared. It is shown that the interfacial stress is a function of entrainment, rather like a Reynolds stress, and plots are given of interfacial stress against local Richardson number multiplied by local upper layer velocity. (Jones-Wisconsin)
W73-13907

SOLUBILITY AND OCCURRENCE OF LEAD IN SURFACE WATER,
Geological Survey, Menlo Park, Calif.
J. D. Hem, and W. H. Durum.
Journal of the American Water Works Association, Vol 65, No 8, p 562-568, August 1973. 4 fig, 3 tab, 25 ref.

Descriptors: *Lead, *Water pollution sources, *Path of pollutants, Water pollution, Water chemistry, *Solubility.

The solubility of lead in river water was evaluated and compared with lead concentrations determined in field studies of surface waters. Direct measurements of the rate of transfer of lead from the atmosphere to the land surface were made for two periods in May and June 1971 in Menlo Park, California. Samples of rainfall obtained at the U.S. Geological Survey in Menlo Park during the 1971 calendar year showed a wide range of lead concentration, from a few micrograms per liter to more than 100 micrograms per liter. A considerable amount of the lead could usually be removed by filtration of the rainwater. The total rainout of lead was small compared with the dry fallout rate. Direct fallout of larger particles containing lead is the most important transfer mechanism at Menlo Park, and the fallout process is probably relatively constant and to a considerable degree independent of rainfall. Generally, regions most productive of runoff are less likely to have a high lead fallout rate, but runoff originating in urban areas may tend to be high in lead concentration. Higher lead concentrations in runoff water and perhaps also in impounded raw-water supplies should therefore be anticipated in such areas as the northeastern U S, urbanized areas in the South, and along the Pacific Coast. High concentrations of lead in stream sediment can be expected in most urbanized areas, expecially the larger ones that are located in relatively dry climatic regions. (Knapp-USGS)
W73-13960

CONTAMINATION OF DISCHARGE WELL FROM RECHARGE WELL,
Missouri Univ., Columbia. Dept. of Civil Engineering.
C. W. Lenau.
Journal of the Hydraulics Division, American Society at Civil Engineers, Vol 99, No HY8, Paper 9958, p 1247-1263, August 1973. 3 fig, 1 tab, 10 ref, append.

Descriptors: *Path of pollutants, *Groundwater movement, *Computer programs, Seepage, Steady flow, Waste disposal wells, Injection wells, Mixing, Dispersion, *Recharge wells.

Waste from a recharge well mixed with natural groundwater and part of this waste was recovered by a neighboring discharge well. These two wells are situated in a confined aquifer through which there is a natural uniform flow. The wells fully penetrate the aquifer, the flow is steady, and the aquifer medium is homogeneous and isotropic. The density and viscosity of the recharge water are the same as the natural groundwater. By the application of potential flow theory based on Darcy's law, the flow field may be generated by the superposition of a source, a sink, and a uniform flow. Longitudinal dispersion is negligible compared to convection in the case of a single recharge well in an aquifer with uniform flow. In the convective dispersion equation, seepage velocity is replaced by the uniform flow velocity. The longitudinal dispersion term is neglected. A closed form solution is obtained for the discharge well concentration as a function of position (relative to the recharge well), pumping rate of both wells, and lateral dispersion. Part of the computer program used to solve the equations is given. (Knapp-USGS)
W73-13962

PHYSICO-CHEMICAL CHARACTERISTICS OF THE MUNICIPAL WASTE WATERS OF THE GREAT MONTREAL AREA (QUEBEC) (CARACTERISTIQUES PHYSICO-CHIMIQUES DES EFFLUENTS URBAINS DE L'AGGLOMERATION DE MONTREAL (QUEBEC)),
National Inst. of Scientific Research, Quebec.
D. Mascolo, D. Cluis, D. Couillard, and M. Meybeck.
INRS-Eau Technical Report No 4, June 1972. 20 p, 9 tab.

Descriptors: *Sewage effluents, Quality control, *Chemical analysis, *Monitoring, Phosphates, Biochemical oxygen demand, Chemical oxygen demand, *Canada, Water pollution sources, Pollutant identification.
Identifiers: *Montreal.

A study of 34 effluents (sewage) of the Montreal area (Quebec) was performed during summer 1971. The effluents of different types (i.e., domestic raw sewage), treated sewage, combined sewage-storm overflow are discharged into the Des Mille-Iles and the Des Prairies rivers. During a period of 36 hours, discharge was measured every 15 minutes and samples were taken every 30 minutes. Composite 6 hours samples were subjected to the following analyses: BOD5, COD, dissolved oxygen, orthophosphates, total phosphates, NO2, NO3, CL-, ABS, total solids, and conductivity. Daily per capita loading were calculated; typical daily loading were: 49g. BOD per capita, 117 g. COD per capita, and 5.3g. total phosphates per capita, corresponding to a daily water consumption of 120 US gallons per capita. (INRS-Eau)
W73-13991

EXPERIMENTAL STUDY ON THE ADSORPTION OF POLIO VACCINE VIRUS TYPE 2, DURING FILTRATION THROUGH MILLIPORE-MEMBRANE FILTERS (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
A. Hechmat.

Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe A Med Midrobiol Parasitol, Vol 219, No 4, p 420-425, 1972, English summary.
Identifiers: Adsorption, Bacteria, Filters, *Filtration, *Membrane filters, Millipore, *Polio virus types, Vaccine, *Virus.

In the field of water-hygiene, especially in identification of virus in surface and waste water, it is often necessary to free the sample water from turbid substances and bacteria. Whereas some examiners pointed out the adsorbing ability of membrane filters for virus, others did not regard the phenomenon to be disturbing. Since millipore-membrane filters as cellulose-derivatives are often used in practice, the DAWP-filter with a medium pore-diameter of 650 nm was chosen to show the adsorption-effect for a stock of poliomyelitis-virus at different pH values and salt-concentrations. In a millipore-membrane filter with a diameter of 14 cm varying quantities of the given virus-substance are retained. When using distilled water as suspending agent, the smallest quantity is found. An increase in the NaCl-concentration of the solution leads to increased adsorption of the virus particles. Use of a 0.66 M phosphate-buffer also leads to distinct loss of virus in the filtered substance. The findings with pH 5 and pH 8 are nearly identical. Filtration experiments with a filter-diameter of 5 cm and an 8-9 times greater load for the filter did not cause a remarkably different loss of virus. The effect of a higher salt-concentration on the adsorption of virus is noted.--Copyright 1973, Biological Abstracts, Inc.
W73-13994

METHANE IN LAKE KIVU: NEW DATA BEARING ON ITS ORIGIN,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02H.
W73-14016

MERCURY IN THE PULP AND PAPER MILL ENVIRONMENT--APPRAISAL AND PERSPECTIVE,
Westvaco Corp., Laurel, Md. Laurel Research Center.
J. Marton, and T. Marton.
Tappi, Vol 55, No 11, p 1614-1618, Nov 1972. 7 tab, 15 ref.

Descriptors: *Mercury, *Water pollution sources, *Pulp and paper industry, *Air pollution, Surveys, Fuels, Fossil fuels, Coals, Water pollution, Incineration.
Identifiers: Mercury compounds.

The contribution of the pulp and paper industry to mercury-cause pollution of air and water was investigated by studying mercury discharges in the vicinity of five pulp and paper mills. Although the U.S. paper industry no longer uses mercurial chemicals, its main raw materials still contain mercury as a contaminant. Only a minor amount, ca. 0.1 lb. of mercury per ton of pulp produced, is discharged into waterways. Its accumulation in riverbeds around three of the mills studied was barely detectable. The mercury content of several paper and board products was determined at approx. 0.1 ppm. About 25% of the paper produced in the U.S.A. is being incinerated. Even if all paper were burned, releasing about 14 tons per year of mercury into the atmosphere globally, it would constitute only a small fraction of the approximately 5000 metric tons released by combustion of fossil fuels, not to speak of a similar amount (5000 tons) discharged annually into rivers by diverse other industrial and agricultural activities. The most significant airborne discharge of mercury by the paper industry, viz., 1-2 lb. per 1000 tons of pulp manufactured, stems from combustion of coal. The fuel consumption of the paper industry represents only about 25% of all coal being burned. (Brown-IPC)
W73-14017

METHANOL, ETHANOL, AND ACETONE IN KRAFT PULP MILL CONDENSATE STREAMS,
WashingtonUniv., Seattle. Coll of Forest Resources.
D. F. Wilson, I. N. Johanson, and B. F. Hrutfiord
Tappi, Vol 55, No 8, p 1244-1246, Aug 1972. 1 fig, 3 tab, 10 ref.

Descriptors: *Water pollution sources, *Pulp wastes, *Alcohols, Organic compounds, Biochemical oxygen demand, Effluents, Pollutants, Waste water (Pollution), Softwood, Hardwood, Deciduous trees, Coniferous trees, Hemlock trees, Douglas fir trees, Industrial wastes, Byproducts, Pulp and paper industry.
Identifiers: *Methanol, *Ethanol, *Acetone, Ketones, Kraft mills, Condensates, Steam volatile compounds, Pulpwood, Alder (Alnus), Western red-cedar (Thuja plicata), Red-cedar trees (Thuja).

Methyl and ethyl alcohols and acetone are major water-soluble, steam-volatile compounds found in kraft pulp mill condensate streams. As important sources of biodegradable organic matter, they have been estimated to contribute one-third of the total effluent BOD in a kraft linerboard mill. The amount of methanol in particular depends on the pulpwood species. Hardwoods can yield about twice as much methanol as do softwoods. Depending on pulping conditions, condensate streams contain about 8 lb methanol per ton of pulp for coniferous species and 12 lb per ton for deciduous species. Laboratory digestions have yielded nearly double these amounts, viz., 14-16 lb per ton for western hemlock and Douglas-fir, and 26-28 lb per ton for red alder and western red-cedar. Individual condensate streams showed methanol concentrations ranging from 300 to 8000 ppm. Evaporator condensate contained the largest total amount, but the lowest concentration of methanol. Digester relief condensate had the highest concentration. The amount of ethanol plus acetone was only about one-tenth that of methanol. (Brown-IPC)
W73-14019

COLOR OF PULP INDUSTRY WASTE LIQUORS. II. AUXOCHROMES AND CHROMOPHORES IN CHLORINE-OXYLIGNIN (IN JAPANESE).
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Sameshima, M. Sumimoto, and T. Kondo.
Mokuzai Gakkaishi (Journal of the Japan Wood Research Society), Vol 18, No 4, p 191-196, 1972. 10 fig, 10 ref. (English summary).

Descriptors: *Bleaching wastes, *Color, *Waste water (Pollution), *Pulp wastes, *Lignins, Molecular structure, Hydrogen ion concentration, Industrial wastes, Pollutants, Foreign research.
Identifiers: Functional groups, Chromophores, Quinones, Carbonyl groups, Kraft mills, *Japan.

Chlorine-oxidized lignin was the major color body in effluents from multistage kraft pulp bleaching plants. The importance of acidic functional groups as auxochromes was indicated by the dependence of the color of oxylignin on its solution pH and its degree of methylation, i.e., methoxyl group substituents. Unlike in other lignin preparations, both weak and strong acidic groups in oxylignin function as characteristic auxochromes. Reduction with sodium borohydride indicated that carbonyl groups were the most important of the complex auxochromes in oxylignin, and that these groups, possibly including hydroxybenzoquinone structures, were closely related to the auxochromic acidic groups. (Brown-IPC)
W73-14028

DETERMINATION OF THE CONCENTRATION OF MERCAPTANS AND SULFIDE IONS IN AQUEOUS EFFLUENTS, (OPREDELENIE KONTSENTRATSII MERKAPTANOV I SUL'-FID-IONA V STOCHNYKH VODAKH),
For primary bibliographic entry see Field 05A.
W73-14032

WASTE WATER FROM FIBREBOARD MILLS,
For primary bibliographic entry see Field 05D
W73-14036

ESTIMATION OF GROWTH RATE FROM MITOTIC INDEX,
California Univ., Davis. Dept of Bacteriology
K-T Chung, E. H. Nilson, M. J. Case, A. G. Marr, and R. E. Hungate
Applied Microbiology, Vol 25, No 5, p 778-780, May 1973. 3 fig, 1 tab, 10 ref.

Descriptors: *Growth rates, *Cytological studies, Estimating, *Microorganisms, E. coli, Growth, Equations, Inhibitors.
Identifiers: *Mitosis, Data interpretation, Chloramphenicol.

The growth rate of a eukaryotic population dividing at a constant rate can be estimated from the equation, t sub m/g ln 2 equals l/n (1 plus R), in which t sub m is the time required for mitosis, g is the generation time, and R is the fraction of cells undergoing mitosis. Values for t sub m and R can be determined by direct microscope examination of the population. The validity of the derived equation has been checked with an exponentially growing culture of a prokaryote, Escherichia coli, in which chloramphenicol was administered to inhibit protein synthesis. Cells having enough protein completed the division process whereas the rest of the population was inhibited. From the plot of the growth curve before and after administration of chloramphenicol, t sub m and R were estimated. The calculated and actual growth rates were almost identical. (Holoman-Battelle)
W73-14061

AMMONIUM REGULATION IN ASPERGILLUS NIDULANS,
Glasgow Univ. (Scotland). Dept. of Genetics.
J. A. Pateman, J. R. Kinghorn, E. Dunn, and E. Forbes.
Journal of Bacteriology, Vol 114, No 3, p 943-950, June 1973. 2 fig, 3 tab, 16 ref.

Descriptors: *Absorption, *Pathogenic fungi, Model studies, Path of pollutants, Enzymes, Nitrogen compounds, Inorganic compounds, Organic compounds.
Identifiers: *Ammonium, *Mutants, *Aspergillus nidulans, *Regulation (Chemical), NADP-glutamate dehydrogenase, L-Glutamate, Thiourea, Methylammonium, Chemical concentration, Biological magnification, Nitrate reductase, Actionmycetes.

L-Glutamate uptake, thiourea uptake, and methylammonium uptake and the intracellular ammonium concentration were measured in wild-type and mutant cells of Aspergillus nidulans held in various concentrations of ammonium and urea. Mycelia for uptake and enzyme assays were grown in shaken cultures at 25C for 18-20 h, harvested, and, for enzyme assays, extracted according to Cove (1966). The levels of L-glutamate uptake, thiourea uptake, nitrate reductase, and hypoxanthine dehydrogenase activity are determined by the extracellular ammonium concentration. The level of methylammonium uptake is determined by the intracellular ammonium concentration. The uptake and enzyme characteristics of the ammonium-derepressed mutants, meaA8, meaB6, DER3, amrA1, xprD1, and gdhA1, are described. The gdhA mutants lack normal nicotinamide adenine dinucleotide phosphate-glutamate dehydrogenase (NADP-GDH) activity and are derepressed with respect to both external and internal ammonium. The other mutant classes are derepressed only with respect to external ammonium. The mutants meaA8, DER3, amrA1, and xprD1 have low levels of one or more of the L-glutamate, thiourea, and methylammonium uptake systems. A model for ammonium regulation in A. nidulans is put forward which suggests: (i) NADP-GHD located in the cell membrane complexes with

xtracellular ammonium. This first regulatory omplex determines the level of L-glutamate up- ake, thiourea uptake, nitrate reductase, and anthine dehydrogenase by repression or inhibi- ion, or both. (ii) NADP-GDH also complexes with ntracellular ammonium. This second and different orm of regulatory complex determines the level f methylammonium uptake by repression or in- ibition, or both. (Holoman-Battelle)
W73-14068

ITRATE REDUCTION AND THE GROWTH OF VEILLONELLA ALCALESCENS,
Cornell Univ., Ithaca, N.Y. Div. of Biological Sciences.
C. B. Inderlied, and E. A. Delwiche.
Journal of Bacteriology, Vol 114, No 3, p 1206-1212, June 1973. 3 fig, 6 tab, 16 ref.

Descriptors: *Anaerobic bacteria, *Pathogenic bacteria, *Reduction (Chemical), *Nitrates, *Essential nutrients, Absorption, Growth rates, Inhibitors, Chemical reactions, Enzymes, Nitrogen compounds, Ammonium salts, Cultures, Respiration, Nutrient requirements.
Identifiers: *Veillonella alcalescens, Bacterial physiology, Nitrate reductase, Substrate utilization, Assimlation, Pyruvate, Ammonium chloride, Growth media.

Veillonella alcalescens, a strict anaerobe, was found to possess a nitrate reductase system which has characteristics of both assimilatory and respiratory nitrate reduction. The nitrate reductase has been identified tentatively as a particulate enzyme which utilizes a variety of electron donors for the reduction of nitrate. By use of N-15-labeled nitrate, it was shown that under appropriate conditions nitrate nitrogen is incorporated into cell material. V. alcalescens grown on pyruvate and nitrate has a greater growth rate than cells grown on pyruvate alone. Growth can occur in a medium with hydrogen and nitrate as the sole energy source. Ammonium chloride decreases the rate of nitrate reduction but does not completely inhibit reduction or incorporation. The results suggest that nitrate assimilation and respiration are not as distinct as in some other organisms. (Holoman-Battelle)
W73-14070

MICROFLORA OF SOIL AS VIEWED BY FREEZE-ETCHING,
Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-14071

SUCCESSION: SIMILARITIES OF SPECIES TURNOVER RATES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W73-14073

EFFECT OF THE CHEMICAL COMPOSITION OF THE MEDIUM ON THE GROWTH OF CHLORELLA PYRENOIDOSA,
Instytut Zootechniki, Oswiecim (Poland). Samodzielna Pracownia Biologii Ryb i Strodowiska Wodnego.
For primary bibliographic entry see Field 05C.
W73-14076

STIMULATED BIODEGRADATION OF OIL SLICKS USING OLEOPHILIC FERTILIZERS,
Rutgers--The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 05G.
W73-14086

SOLVENT CHARACTERIZATION BY GAS--LIQUID PARTITION COEFFICIENTS OF SELECTED SOLUTES,
Chemische Werke Huels A.G., Marl (West Germany).
L. Rohrschneider.
Analytical Chemistry, Vol 45, No 7, p 1241-1247, June 1973. 2 fig, 5 tab, 11 ref.

Descriptors: Gas chromatography, Solubility, Water, Solvents, Alcohols, Ethers, *Solutes.
Identifiers: *Partition coefficients, *Organic solvents, Molecular volume, Solvent polarity, Toluene, Ethanol, Methyl ethyl ketone, Dioxane, Nitromethane, Octane.

A method is given for the determination of gas-liquid partition coefficients by gas chromatographic headspace analysis with two different columns. The partition coefficients of n-octane, toluene, ethanol, methyl ethyl ketone, dioxane, and nitromethane are specified for eighty solvents. The correlations of these data with solvent polarity, solubility parameter, and the molecular volume of the solvents are discussed. The measured data reference to the aromatics selectivity of extraction solvents and the solubility for polymers in diverse solvents. (Little-Battelle)
W73-14088

MERCURY AND OTHER TRACE METALS IN THE ENVIRONMENT. A COMPILATION OF FEDERAL GOVERNMENT RESEARCH PROJECTS AND SURVEYS AUGUST 1971.
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.

Report, August 1971. J. W. Schmidt, Compiler. 50 p, 4 ref.

Descriptors: *Mercury, *Analytical techniques, *Water pollution effects, *Water pollution sources, Trace elements, Heavy metals, Primary productivity, Pollutant identification, Sediments, Fish physiology, Nitrilotriacetic acid, Food chains, Bioindicators, Bioassay, Pesticides, Toxicity, Soils, Water analysis, Fish, Absorption, Arctic Ocean, Clams, Canada, Great Lakes, Lake Erie, Lake Ontario, Chelation, Suspended solids, Boron, Pesticide residues, Geochemistry, Lead, Nickel, Zinc, Cadmium, Wastes, Sludge, Mass spectrometry, Copper, Salmon, Iron, Molybdenum, Manganese, Aluminum, Cobalt, Chromium, Strontium, Acid mine water, Cations, Separation techniques.
Identifiers: Methyl mercury, Lake Winnipeg, Lake of the Woods, Saskatchewan River, Lake St. Clair, Ligands, Le Have River, Barium, Silver, Tithium, Thalium, Uranium, Vanadium, Atomic absorption spectrophotometry, Biological samples, Arsenic, Selenium.

Brief summaries are presented of Canadian research projects related to mercury and other trace elements in the environment. Recent publications and research grants are also listed. The purpose was to allow those working in the area to become more aware of other groups and individuals who are actively pursuing related projects and to thus stimulate cooperation. The projects covered include work related to the analysis of water, soil, and sediments for mercury and other toxic metals, the sources of mercury in the environment, and the effects of mercury and other trace elements on aquatic flora and fauna. (Mortland-Battelle)
W73-14089

A STUDY OF NUTRIENT VARIATIONS IN THE SURFACE AND MIXED LAYER OF MONTEREY BAY USING AUTOMATIC ANALYSIS TECHNIQUES,
Naval Postgraduate School, Monterey, Calif.
G. O. Paulson.
Available from the National Technical Information Service as AD-757 700. Master's Thesis, September 1972. 151 p, 57 fig, 9 tab, 21 ref.

Descriptors: Surface waters, *Automation, Variability, *Sea water, *Mixolimnion, *Nutrients, Essential nutrients, Water circulation, Chemical analysis, Water analysis, Methodology, Mixing, Silicates, Phosphates, Nitrates, Nitrites, Depth, Eutrophication, Upwelling, Limiting factors, Chlorophyll, Nitrogen compounds, Ecological distribution, Plankton, Water sampling, Salinity, Profiles, Colorimetry, Instrumentation, Research equipment, Iron, Color, Turbidity, Sulfides, Oceanography, Pollutant identification, *California.
Identifiers: *Monterey Bay, Technicon Autoanalyzer II System, Shipboard measurements, On board analysis, Reproducibility, Sensitivity, Accuracy, Error sources, Data interpretation, Orthophosphates, Chemical interference, Tannins, Precision, Assimilation.

Concentrations of silicate, phosphate, nitrate, and nitrite were determined in Monterey Bay, California. Data were collected aboard ship during four cruises in April and May, 1972 using the Technicon (Trademark) AutoAnalyzer (Trademark) II System in dual channel operation. The sensitivity, reproducibility, and accuracy of this system were investigated and the results presented. Nutrient concentrations were presented as surface variations, depth variations, and vertical profiles. The large variability of nutrient concentrations in the ocean area studied was discussed. Upwelling areas were investigated for nutrient concentrations, circulation patterns, and variations in nutrient ratios. Planktonic bloom areas have been identified from the low nutrient levels, low nutrient ratio values, and high chlorophyll correlations. Results indicate that silicate was the limiting nutrient to biological activity in the waters studied. Assimilation ratios for biological activity were found to be 16.33 for NO3:PO4 and 1.14 for SiO4:PO4. Nutrient plateau regions were analyzed and sources discussed. The major cause of nutrient concentration changes in the area (except plankton blooms) as determined from nutrient ratio studies was found to be circulation of the water masses. (Holoman-Battelle)
W73-14090

POLYCHLOROBIPHENYLS (PCBS) AND RELATED CHLOROPHENYLS: EFFECTS ON HEALTH AND ENVIRONMENT. I. BIBLIOGRAPHY 1881-1971,
Oak Ridge National Lab., Tenn. Toxicology Information Response Center.
For primary bibliographic entry see Field 05C.
W73-14091

INTERACTIONS OF TETRAHYMENA PYRIFORMIS, ESCHERICHIA COLI, AZOTOBACTER VINELANDII, AND GLUCOSE IN A MINIMAL MEDIUM,
Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
For primary bibliographic entry see Field 05C.
W73-14095

PUBLIC HEALTH ASPECTS OF ORGANICS IN WATER,
California State Dept. of Public Health, Berkeley.
For primary bibliographic entry see Field 05C.
W73-14098

MODELING SNOWMELT RUNOFF IN AN ARCTIC COASTAL BASIN,
R. Carlson, W. Norton, and R. Britch.
Paper presented at International Symposia on the Role of Snow and Ice in Hydrology, UNESCO-Session: WMO-2b, September 6-13, 1972. Banff, Canada. 14 p, 5 fig, 6 ref. OWRR A-031-ALAS (2).

Descriptors: *Snowmelt, *Runoff forecasting, *Arctic, *Alaska, *Model studies, Oil industry, Oil spills, Analytical techniques, Hydrographs, Climatic data, Path of pollutants.
Identifiers: *Snowmelt runoff forecasting.

Present and impending oil exploration and development activity on Alaska's Arctic Coastal Plain has led to a need for a better understanding of the region's water resources. The remoteness of the area and an almost complete lack of hydrologic data preclude the use of the usual hydrologic analysis techniques. As a possible alternative, a snowmelt-runoff model has been developed which simulates this important part of the hydrologic system, and which causes most of the outflow. The initial model simulation operates in two parts. The first is a snowmelt hydrograph generation program which uses a four-component energy teansfer computation to transform climatological information into snowmelt. The second part uses a two-parameter linear storage model to transform the snowmelt hydrograph into the runoff hydrograph. A test run using 1971 data for the Putuligayak River basin indicates that the model performs satisfactorily, although a need for improvement is clearly indicated. Future model development will investigate an inclusion of a delay factor in the snowmelt process, a further delineation of the surface and channel storage, and a provision for channel delay. (Woodard-USGS)
W73-14109

RELATION OF CHANNEL SLOPE TO REAERATION OF MICHIGAN STREAMS,
Geological Survey, Okemos, Mich.
T. R. Cummings.
Open-file report, May 1973. 19 p, 5 fig, 1 tab, 4 ref.

Descriptors: *Reaeration, *Streams, *Michigan, Water pollution, Mathematical studies, Equations, Regression analysis, Correlation analysis, Channel morphology, Depth, Streamflow, Flow rates, Average flow, Low flow, Water quality, Waste assimilative capacity, Organic wastes, Self-purification.
Identifiers: *Reaeration coefficients.

Reaeration coefficients (k2), which are rate constants for the process of oxygen absorption from the atmosphere, were computed for Michigan's streams using an equation developed by Bennett and Rathbun (1972). Mean velocity and mean depth data, which are necessary for the computation, were extracted from discharge measurements made at gaging stations throughout the State. The computed k2 values were related to channel slopes obtained from topographic maps. Regression equations were derived that express the relation of k2 to slope for streams at mean flow, median flow, 7-day 2-year low flow, and 7-day 10-year low flow. The equations indicate that an increase in channel slope or a decrease in streamflow increases k2. (Woodard-USGS)
W73-14110

ENVIRONMENTAL POLLUTION BY POTASSIUM PLANT WASTES (ZAGRYAZNENIYE OKRUZHAYUSHCHEY SREDY OTKHODAMI KALIYNOGO PROIZVODSTVA),
For primary bibliographic entry see Field 05C.
W73-14148

TRINITY BAY STUDY: DYE TRACING EXPERIMENTS,
Tracor, Inc., Austin, Tex.
G. H. Ward, Jr.
Available NTIS, Springfield, Va 22151 as N73-17510, Price $3.00 printed copy; $1.45 microfiche. Contract Report to NASA, Manned Spacecraft Center, November 1972. 121 p, 60 fig, 20 tab, 14 ref. NAS 9-12724.

Descriptors: Water pollution sources, *Path of pollutants, *Thermal pollution, *Dye releases, *Bays, *Texas, Aerial photography, Satellites (Artificial), Sampling, Fluorescent dye, *Fluorometry, Remote sensing, Correlation analysis, Winds, Currents (Water), Salinity, Dispersion, Electric powerplants.
Identifiers: *Trinity Bay (Tex).

The NASA/MSC Trinity Bay Study (NASA, 1971) has focused upon the heat balance and temperature distribution within Trinity Bay, Texas, particularly as affected by Houston Lighting and Power Cedar Bayou Generating Station, which draws its cooling water from behind Atkinson Island in upper Galveston Bay and discharges into upper Trinity Bay above Point Barrow. One of the predominant factors governing the distribution of temperature (and, especially, the thermal plume configuration at the Cedar Bayou discharge) is the hydrodynamics of the Trinity Bay System. This is conventionally dichotomized as advective and dispersive. Among the former are included the effects of tidal currents, wind-driven circulations, and large-volume inflows. Among the latter are the effects of turbulent diffusion and local shears in the currents. In practice, there is not clear separation between these two classes of hydrodynamic processes; this depends, in part, upon the resolvable scales of motion, which in turn is determined by methods of measurement and the mathematical representation. (the 'model'). The dye-tracing experiments address specifically the dispersion processes, although advective information is extracted as well, when appropriate. (Woodard-USGS)
W73-14164

UNCERTAINTIES IN WATER QUALITY MODELING: THE CASE OF ATMOSPHERIC REAERATION,
Rutgers--The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05G.
W73-14169

TRANSFER OF CS-137 FROM DETRITUS TO PRIMARY PRODUCER,
Oak Ridge National Lab., Tenn.
M. Witkamp.
Available from the National Technical Information Service as CONF-711213-1. Report December 13, 1971. 12 p, 2 fig, 2 tab, 3 ref.

Descriptors: *Detritus, *Cycling nutrients, *Tracers, *Path of pollutants, Model studies, Vegetation, Ecosystems, Laboratory tests, Radioecology, Systems analysis, Food chains, Trophic level, Plant growth, Animal growth, Snails, Trees, Analog computers, Computer models, Analog models, Decomposing organic matter.
Identifiers: Mobilization, *Cs-137, *Transfer coefficients, Cesium radioisotpes, Paravitrea, Millipedes, Fate of pollutants, Dixidesmus erasus, Plants.

A combination of radiotracer, microcosm, and systems analysis techniques was used in evaluating recycling of minerals from detritus back to the vegetation. A greenhouse experiment with microcosms of increasing complexity showed the effects of millipedes and snails on Cs-137 movement from leaf litter to tree seedlings. Millipedes increased the organic matter content of the soil and the concentration and availability of Cs-137. The increase in growth and mineral uptake by plants suggests that millipedes affect both nutrient and Cs-137 kinetics in similar ways. With snails there were smaller increases in Cs-137 turnover in soil and less tree growth than with millipedes. Snails also reduced plant growth by consuming part of the foliage. Gross transfer coefficients for movement of Cs-137 from detritus to plants were determined through analysis of Cs-137 turnover using a simulation model. (Holoman-Battelle)
W73-14183

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A),
Michigan Univ., Ann Arbor. School of Natural Resources
For primary bibliographic entry see Field 05C.
W73-14185

KINETICS OF AMINO ACID INFLUX INTO NITELLA FLEXILIS,
Windsor Univ. (Ontario). Dept. of Biology
For primary bibliographic entry see Field 05C.
W73-14186

ECOLOGICAL CONCEPT OF THE COASTAL ZONE IN THE GREAT LAKES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske.
Available from the National Technical Information Service as COO-2003-10. Report, May 1971. 16 p, 2 fig, 1 tab, 14 ref.

Descriptors: *Ecosystems, *Great Lakes, *Ecology, *Aquatic environment, Coasts, Salinity, Flow, Water circulation, Path of pollutants, Nutrients, Water temperature, Thermal stratification, Waste assimilative capacity, Lake Michigan, Lake Erie, Lake Ontario, Lake Superior, Lake morphometry, Lake Huron, Discharge (Water), Chlorides, Upwelling, Aquatic productivity.
Identifiers: *Coastal zones, Marine environment, Thermal bar, Fate of pollutants.

The coastal zone of the Great Lakes may be similar to the marine coastal zone in many respects, but in terms of ecological processes it must be viewed as part of the lake ecosystem and cannot be treated separately. Some of those differences between the coastal zones include salinity, residence times of water, circulation period, biological productivity, limiting nutrients, and the direction of the flow of water. In order to study the coastal zone adequately, the entire lake ecosystem must be studied. For some types of problems, such as chloride pollution, the five Great Lakes must be considered as a system. (Holoman-Battelle)
W73-14193

PHOTOLYSIS OF ETHYLENETHIOUREA,
California Univ., Davis. Dept. of Environmental Toxicology.
For primary bibliographic entry see Field 05C.
W73-14194

EFFECT OF NUTRIENT ADDITIONS ON THE APPARENT COMETABOLISM OF DDT,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 05C.
W73-14196

ESTIMATION OF ESTUARINE MARSH PRODUCTIVITY,
Delaware Univ., Newark. Dept. of Biological Sciences.
E. De Michele.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE3, p 397-404, June 1973. 1 fig, 1 tab, 14 ref.

Descriptors: *Aquatic productivity, *Estimating, *Estuarine environment, *Tidal marshes, *Measurement, *Biochemical oxygen demand, Primary productivity, Model studies, Turbulent flow, Transportation, Dispersion, Organic matter, Adsorption, Equations, *Delaware.
Identifiers: *Murderkill River (Del), Convective-diffusion equation.

The adsorptive and absorptive capabilities of tidal marshlands, have, in the past, been estimated using various techniques. Thus far it has been dif-

ficult to measure the organic matter representative of marsh productivity. To eliminate some of the distortions associated with such measurements, a model based on the convective-diffusion equation was used to estimate 5-day BOD additions from a tidal marsh to a northern temperature zone estuary. Use of the model involves: (1) determination of river coefficients for conservative and nonconservative substances, based on measured concentration profiles, for periods of maximum and minimum marsh activity; and (2) calculation of river reaction rates. Organic removals for the two periods of extreme marsh activity then may be compared to provide a means of estimating net marsh productivity. Data collected over a 6-yr period were used to demonstrate the previously described technique. The extensive marshy area fringing Delaware's Murderkill River estuary (drainage area of 107 sq miles) is found to contribute 1,050 lb per day 5-day biochemical oxygen demand during the summer months. No attempt was made to evaluate contribution per unit area of marsh. (Holoman-Battelle)
W73-14199

5C. Effects of Pollution

ECOLOGICAL IMPLICATIONS OF DIMETHYL MERCURY IN AN AQUATIC FOOD CHAIN,
Utah Water Research Lab., Logan.
L. P. Kolb, D. B. Porcella, and E. J. Middlebrooks.
Available from the National Technical Information Service as PB-222 971, $3.50 in paper copy, $1.45 in microfiche. Research Project Technical Completion Report PRWG105-2, June 1973. 50 p, 18 fig, 29 tab, 44 ref. OWRR B-070-UTAH (3). 14-31-0001-3659.

Descriptors: *Mercury, *Bioassays, Toxicity, Ecosystems, *Food chains, *Algae, *Daphnia, Fish, *Volatility, Metabolism, Water pollution effects, Path of pollutants.
Identifiers: Methylation, *Dimethyl mercury, *Fathead minnows, Microbial methylation, Desorption.

Laboratory studies indicate dimethyl mercury may be a major product of microbial methylation in organic mercury. Although another methylation product, monomethyl mercury, has been extensively studied, the physical, chemical, and biological factors affecting the transport and food chain distribution of dimethyl mercury have remained unclear. Results are presented of laboratory studies of volatilization rates from water as a function of temperature and mixing conditions, uptake kinetics and equilibrium concentrations in algae, Daphnia, and fish, toxicity to fish, and studies of metabolism of dimethyl mercury by microbes. Mercury - 203 labeled dimethyl mercury was used in the study, and in all tests the organisms used were live counted. A unique method was developed for measuring dimethyl mercury uptake in algae. In water, dimethyl mercury was found to behave similarly to nonreactive gases such as oxygen. Volatilization occurred rapidly.
W73-13657

AN INVESTIGATION OF THE CAUSE AND EFFECT OF EUTROPHICATION IN LONG LAKE, WASHINGTON,
Eastern Washington State Coll. Cheney. Dept. of Biology.
R. A. Soltero, A. F. Gasperino, and W. Graham.
Available from the National Technical Information Service as PB-222 937, $3.75 in paper copy, $1.45 in microfiche. Project Completion Report, July 1973. 86 p, 18 fig, 23 tab, 45 ref. OWRR A-058-WASH (1).

Descriptors: *Nutrients, Nitrogen, *Eutrophic action, Productivity, Chlorophyll, Phytoplankton, Zooplankton, *Washington, Water pollution sources, Phosphates, Primary productivity.
Identifiers: Long Lake (Wash), *Nitrate-nitrogen, *Orthophosphates.

Surveillance on the Spokane River and its tributaries has shown that a major source of nutrients influent to Long Lake was the effluent of the Spokane sewage treatment plant. Existing concentrations of nitrate nitrogen and orthophosphate increased threefold and tenfold, respectively, below the effluent. Of the influent phosphate, 14% was retained in the reservoir. The major fractions retained were the soluble organic phosphate and orthophosphate. A density current system was evident which altered vertical and longitudinal distribution of physical and chemical parameters. This current isolated a wedge of water on the reservoir bottom and the water became anaerobic. During the period of anaerobiosis orthophosphate phosphorus and nitrate nitrogen maxima are present. Long Lake was classified as eutrophic on a basis of primary productivity, chlorophyll a concentrations, hypolimnetic oxygen depletion, and nitrogen and phosphorus concentrations. Euphotic zone nitrate nitrogen and orthophosphate concentrations correlated negatively with chlorophyll a and phytoplankton standing crops, however the latter correlated positively with temperature. Zooplankton grazing did not significantly limit phytoplankton production.
W73-13658

BIOLOGICAL IMPACT OF COMBINED METALLIC AND ORGANIC POLLUTION IN THE COEUR D'ALENE-SPOKANE RIVER DRAINAGE SYSTEM,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05B.
W73-13659

A CLASSIFICATION OF THE LAKES OF OREGON,
Oregon State Univ., Corvallis. Air and Water Resources Research Inst.
For primary bibliographic entry see Field 02H.
W73-13717

INFECTION OF AMERICAN SMELT IN LAKE ONTARIO AND LAKE ERIE WITH THE MICROSPORIDIAN PARASITE GLUGEA HERTWIGI (WEISSENBERG),
Saskatchewan Fisheries Lab., Saskatoon.
M. Chen, and G. Power.
Can J Zool. Vol 50, No 9, p 1183-1188, 1972. Illus.
Identifiers: American smelt, *Lake Erie, *Lake Ontario, Glugea-hertwigi, Lakes, Ovary, *Parasites microsporidian, Pathology, Seasonal, *Smelt infection.

In samples taken monthly throughout the year the percentage of American smelt in Lake Ontario and Lake Erie containing cysts of G. hertwigi was 5.2% and 62.7%, respectively. Sexual differences in incidence were observed, the significance of which was uncertain as results from the 2 lakes were contradictory. In male fish infection was almost entirely restricted to the digestive tract with few cysts in the liver, skin, and testes. In female fish the digestive tract and ovaries were similarly infected. Seasonal fluctuations in Glugea infection were obvious and seemed correlated with the gonadal cycle. In both sexes the highest parasite load corresponded with the onset of maturation. A striking difference in fecundity between the 2 smelt populations was attributed to the Glugea infection. In females parasite cysts replaced ovarian tissue, causing a reduction in the number of maturing eggs.--Copyright 1973, Biological Abstracts, Inc.
W73-13718

PART I--MANAGEMENT OF WATER RESOURCES QUALITY. THE NATURAL QUALITY OF WATER RESOURCES,
Thames Conservancy, London (England).
For primary bibliographic entry see Field 05G.
W73-13722

OVERWINTER DRAWDOWN: IMPACT ON THE AQUATIC VEGETATION IN MURPHY FLOWAGE, WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Research.
T. D. Beard.
Technical Bulletin No 61, 1973. 13 p, 3 fig, 5 tab, 8 photos, 13 ref.

Descriptors: *Drawdown, *Aquatic weed control, *Wisconsin, Distribution, Water level fluctuations, Pondweeds, Winter, Freezing, Environmental effects, Management, Fish reproduction.
Identifiers: *Murphy Flowage (Wis), Water lily, Water milfoil, Coontail, Water marigold.

After an initial study of the effect of two overwinter drawdowns on aquatic vegetation in Murphy Flowage (Wisconsin), this study determined the reinvasion of certain species into the flowage and various management implications of an overwinter drawdown. There was a drastic change in abundance of aquatic vegetation after the drawdowns. Potamogeton robbinsii, most abundant plant in 1967, covering 104.4 acres was reduced to 8.0 acres in 1968 and 3.1 acres in 1969; Nuphar was reduced from 43.1 acres in 1967 to 10.2 acres in 1969; and Myriophyllum from 19.8 acres in 1967 to 2.9 acres in 1969. The five species most affected by the drawdown showed an approximate acreage reduction after the drawdowns of 187.3 acres. Re-invasion by Najas flexilis, Magalodonta beckii and Potamogeton diversifolius was beginning after the second drawdown. The drawdown released approximately 65 acres for fishing in 1968 and 60 acres were still open by 1969 after the second drawdown. Interference with reproduction due to low water levels was probably the major factor involved in the reduction of aquatic vegetation. Type of vegetation, invasion of resistant species after drawdown, phytoplankton bloom, timing and number of drawdowns, winterkill, fishing pressure and other uses should be given management consideration. (Jones-Wisconsin)
W73-13723

SAPROBIC SUCCESSIONS,
V. Sladecek.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 896-902, 1972. 3 fig, 1 tab, 8 ref.

Descriptors: *Biodegradation, *Succession, *Degradation (Decomposition), Eutrophication, Self-purification, Biological communities, Bacteria, Systematics, Protozoa.
Identifiers: Flagellates, Vorticella, Decomposes, Consumers, Producers.

Saprobity is the biological condition of water with respect to amount and intensity of decomposing organic matter, both of autochthonous as well as allochthonous origin. Saprobity develops in two basic directions indicating the successions of characteristic communities. The progressive saprobic sere with the pioneer stage of katharobity develops after receiving nutrients into a betamesosaprobity and is named eutrophication. The input of organic matter increases the saprobity and changes the communities up to hypersaprobity. The regressive sere is self-purification and means the changes of communities in the reverse direction from hypersaprobity to betamesosaprobity. Within the metasaprobity four communities of colorless flagellates can be recognized. All four communities live in havitats with hugh numbers of bacteria including sulphur bacteria which are anaerobic and which show BOD-5 values in the range 700-200 mg/l. Concentration of hydrogen sulfide reaches mg/l up to g/l. Exceptionally few ciliate individuals resistant to hydrogen sulfide appear. Larger numbers of

ciliates mean a transition into the next better saprobic level, the isosaprobity. The rough biocenotical structure of individual saprobic levels is diagrammed. (Jones-Wisconsin)
W73-13724

HETEROTROPHIC GROWTH IN INDOOR RESEARCH CHANNELS: SELF-PURIFICATION AND PRODUCTION,
T. S. Traaen, K. S. Ormerod, and H. Efraimsen.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 891-895, 1972. 3 fig, 1 tab, 13 ref.

Descriptors: *Biological communities, *Self-purification, *Productivity, Nutrients, Organic matter, Benthos, Carbon, Phosphates, Nitrates, Ammonia, Carbohydrates, Bacteria, Diatoms, Protozoa, Laboratory tests.
Identifiers: *Sewage fungus, Attached growth, Detached growth, Zoogloeal bacteria, Sphaerotilus natans.

This experiment dealt with quantification of nutrient consumption and organism production in an indoor research channel which received organic matter and inorganic nutrients. Detached growth, that is, growth being released in the effluent stream, was collected by filtering through plankton nets and subsequent filtration through preweighed glass fiber filters. Biochemical changes in the channels were detected by analysis of effluent water. Composition of organisms was not obviously different along the channel thus the self-purification process could not be observed by biological criteria. Chemical analysis, however, demonstrated a definite self-purification. The curves for removal of sucrose and nitrate showed a high degree of conformity, while the removal of ammonia was rather variable. Most of the added orthophosphate was removed after 20 days. Subsequent experiments have demonstrated that increased addition of ortho-phosphate leads to increased removal which means that the self-purification capacity of ortho-phosphate was greater than indicated by the experimental results. The removal of added nutrients was very rapid with considerable amounts of organisms produced. Accordingly, the self-purification as defined by the employed parameters might be understood to express the conversion of one type of pollution to another, with the secondary pollution possibly more troublesome than the original. (Jones-Wisconsin)
W73-13726

BIOLOGICAL TRANSFORMATION OF ORGANIC MATTER IN A RIVER,
T. N Sivko, R. Z. Kovalevskaja, T. M. Mikheeva, and A. P. Ostapenia.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 756-760, 1972. 1 fig.

Descriptors: *Energy transfer, *Biological communities, *Organic matter, *Rivers, Phytoplankton, Diatoms, Pyrrophyta, Seasonal, Primary productivity, Sampling, Biomass, Zooplankton, Photosynthesis, Biochemical oxygen demand, Detritus, Respiration, Bacteria, Oxygen, Rotifers.
Identifiers: *Dnieper River (USSR), Mogilyev (USSR), Cyclotella comta, Protococcophyceae, Rhodomonaspusilla, Cryptomonas.

Biological processes in a section of Dnieper River, USSR, from Mogilyev 93 km downstream were studied with limnological methods. Monthly observations at two stations, two series of 72-hour observations with a 4-hour interval and a 48-hour delay to consider current velocity, and single samplings at 11 intermediate stations were made. Phytoplankton, as determined from sediment plankton samples, was mainly represented by diatoms, accounting for 90-95% of total biomass with Cyclotella comta dominant. Higher rate of photosynthesis was found at both stations during second observation series due, apparently, to intensive growth of small size Cyclotella which has a higher photosynthetic activity than large sized cells. About 65% total oxygen was consumed by suspended organic matter, 60% of which was detritus, indicating high metabolic activity of detritic particles and their microflora. If it is assumed algal respiration equals 20% of gross daily photosynthesis, oxygen consumption by algae is about 2 g/sq m oxygen per day, or 40% of its total consumption by water. Zooplankton respiration was represented mainly by rotifers (90% total biomass). The presented values only approximately describe the transformation of organic matter in the river. (Jones-Wisconsin)
W73-13727

THEORETICAL FOUNDATIONS FOR THE STUDY OF PRODUCTIVITY IN AZERBAIJANIAN LAKES AND RESERVOIRS,
A. G. Kasymov, N. F. Likhodeeva, and N. B. Talibov.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 863-866, 1972. 2 tab, 4 ref.

Descriptors: *Biological communities, *Productivity, *Lakes, *Reservoirs, Fisheries, Light penetration, Water temperature, Zooplankton, Rotifers, Crustaceans, Copepods, Biomass, Phytoplankton, Benthos, Larvae, Insects, Mollusks, Dragonflies, Tubificids, Fertilization.
Identifiers: *Azerbaijan (USSR), Lake Abjicabul (USSR), Lake Sarisu (USSR), Lake Akgel (USSR), Lake Karagel (USSR), Mingechaur Reservoir (USSR), Varvarinsk Reservoir (USSR).

Of the 64 lakes and reservoirs in Azerbaijan SSR, three lakes and two reservoirs support the fishing industry. Zooplankton productivity, developing in new impoundments, is discussed. At the first stage of biocenotic formation and productivity, historically formed biocenoses are replaced by intensive intrusion into existing biotopes of stagnant water species; formation of new biocenoses on bases of those previously existing is considered a second stage. In reservoirs on transparent rivers new biocenoses productivity is much lower than that of the original river community. In reservoirs on turbid-water rivers, productivity is much higher in comparison with former river biocenoses. Specific composition of newly formed biocenoses bears a temporary character and Chironomid larvae predominate. In the first year of zooplankton complexes Rotatoria are most abundant and are then replaced by Crustacea. In the third stage the existing biocenoses, as well as productivity of plankton and benthos, become stabilized. As a result of mineralization of the flooded land vegetation, Chironomid quantity becomes sharply decreased. Reservoir bottoms are covered with mud and therefore the typical mudloving forms appear instead of species related to submerged plants. To increase productivity land reclamation must proceed and reservoir bays should be fertilized. (Jones-Wisconsin)
W73-13728

EXPERIENCE IN THE STUDY OF BOTTOM ASSOCIATIONS IN THE DNIEPER RIVER RESERVOIRS AND THEIR PRODUCTIVITY,
V. V. Gurvich, K. S. Vladimirova, G. A. Olivary, and U. V. Scorik.
Verhandlugen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 859-862, 1972.

Descriptors: *Ecosystems, *Benthos, *Reservoirs, Biological communities, Depth, Distribution, Cyanophyta, Chlorophyta, Diatoms, Euglenophyta, Environmental gradient, Biomass, Diptera, Mollusks.
Identifiers: *Dnieper River (USSR), Kiev Reservoir (USSR), Kremenchug Reservoir (USSR), Kakhovska Reservoir (USSR), Nnieprodzerzhinsk Reservoir (USSR), Zaporozhje Reservoir (USSR).

Formation and establishment of ecosystems in reservoirs depend on plant and animal composition and on abiotic factors (morphometry of water bodies, physical, chemical and hydrological peculiarities). Estimation of species composition and quantitative development is of primary importance in elucidating cenosis structure and functions. Formation of bottom cenoses in Dnieper reservoirs begins soon after impoundment. Algae and protozoa are pioneers, insect larvae, mysids, molluscs and other organisms follow. A cenosis is formed during the first 3-4 years. In summer and autumn, more than 50% of biomass weight are algae, mainly Bacillariophyta and Chlorophyta. Animals of these cenoses include Oligochaeta, chironomid larvae, and crustaceans. In spite of the high biomass of bottom cenosis its distribution in the photic zone is irregular. Average biomass of micro- and mesobenthic organisms is four times lower than that of macrobenthos biomass and is considerably lower than phytomicrobenthos. Reservoir deep areas are characterized by a restricted number of cenoses, regardless of reservoir age and location. Analysis of bottom cenoses of Dnieper reservoirs shows a great algal diversity and high biomass compared with that of animals. The greater the number of green algae, diatoms and euglenoids, the richer is the zoobenthos. (Jones-Wisconsin)
W73-13729

SOME BIOLOGICAL PECULIARITIES IN RESERVOIRS IN SOUTH TURKMENIA,
Sh. I. Kogan.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 867-871, 1972. 2 fig, 3 tab, 10 ref.

Descriptors: *Productivity, *Biological communities, *Reservoirs, Arid climates, Solar radiation, Oligotrophy, Hydrobiology, Limiting factors, Phytoplankton, Aquatic plants, Hydrology, Chemical properties, Nitrogen, Phosphorus, Biomass, Turbidity, Water level fluctuations.
Identifiers: *Turkmenia (USSR), Macrophytes.

A number of reservoirs in the Turkmen Republic (USSR) are built for irrigation. In an arid country with high direct solar radiation, they are characterized by low biological production. Some hydrological and hydrochemical data accounting for low productivity of zooplankton, phytoplankton, benthos and fish are discussed. Effect of water transparency and water level variations on phytoplankton development is seen in Kurtli Reservoir of the Kara-Kum channel. Nitrogen and phosphorus contents are very low and the reservoirs are thus considered oligotrophic. The low primary phytoplankton production with high macrophyte production is regarded as one of the typical biological peculiarities of South Turkmenian reservoirs. There are no species of phytoplankton algae in these reservoirs which are significant in moderate latitudes, such as Anabaena flos-aquae, Anabaena lemmermannii, Aphanizomenon flos-aquae and other representatives of blue-green algae. There are, however, some definitely tropical blue-green species and a relatively large number of these are capable of atmospheric nitrogen fixation. Some reservoirs, Keiif, Kurtli, Third Guindukush, are considered eutrophic though they differ considerably from typical eutrophic reservoirs in the European part of the USSR. (Jones-Wisconsin)
W73-13730

SEASONAL CHANGES IN WATER CHEMISTRY OF A TROPICAL LAKE (LAGO DO CASTANHO, AMAZONIA, SOUTH AMERICA),
G. W. Schmidt.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p. 613-621, 1972. 7 fig., 2 tab., 10 ref.

Descriptors: *Tropical regions, *Seasonal, *Water chemistry, Lakes, *South America, Water level

fluctuations, Rainfall, Conductivity, Calcium, Bicarbonates, Chlorides, Silica, Phosphorus, Iron, Oxygen, Sodium, Potassium.
Identifiers: *Lago do Castanho (Brazil), Amazon (South America).

Seasonal water level fluctuations of the Amazon River exercise a controlling influence over its flood plain and produce seasonal differences in many physical-chemical and biological conditions in the numerous lakes of this landscape. The chemistry of Lago do Castanho, whose depth depends on the water level of the Amazon, was studied by standard hydrochemical laboratory methods. Toward the end of October or beginning of November, the river usually begins to rise and back up into the lake basin, where the load of suspended materials is deposited on the lake's floor. As the water level in the river continues to rise, the lake continues to fill until about the middle of June, stagnates briefly, then begins to empty as the river level falls. During the water's sojourn within the basin, its salt content, and, therefore, its electrical conductivity, decreases considerably. Highest values of total iron and total phosphorus for the year were reached before the water dropped to its minimum level. It was determined that chemical conditions in the Lago do Castanho undergo a pronounced yearly cycle, which is ultimately the sole result of water level changes of the Amazon, thus reflecting the rainfall regime over the entire catchment area of this river system. (Jones-Wisconsin)
W73-13731

A PRELIMINARY COMPARISON OF THE ZOOPLANKTON IN A TROPICAL AND A TEMPERATE LAKE (LAKE GEORGE, UGANDA AND LOCH LEVAN, SCOTLAND),
M. J. Burgis, and A. F. Walker.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p. 647-655, 1972. 5 fig., 12 ref.

Descriptors: *Zooplankton, *Tropical regions, *Temperate, *Life history studies, Lakes, Physical properties, Copepods, Dominant organisms, Seasonal, Reproduction, Eutrophication, Population, Standing crops, Biomass, Daphnia.
Identifiers: *Lake George (Uganda), *Loch Leven (Scotland), Cyclops strenuus abyssorum, Thermocyclops hyalinus, Mesocyclops leuckarti, Daphnia barbata.

The major physical parameters of a tropical lake and a temperate lake are described for comparison of their zooplankton. Both lakes contain dense phytoplankton populations. Blue-green algae, particularly Microcystis spp. are dominant throughout the year, and the mean concentration of chlorophyll-a shows relatively little variation in Lake George. In Loch Leven blue-green algae are frequently abundant and chlorophyll concentrations are highest in April and May, but the species composition of the population shows no regular pattern of seasonal variation or succession. Submerged aquatic macrophytes are sparse in both lakes. The zooplankton in both lakes is dominated by a species of cyclopoid copepod. In Loch Leven Cyclops strenuus abyssorum contributes 99% to the total crustacean zooplankton numbers. In Lake George Thermocyclops hyalinus accounts for 80 to 96% and Mesocyclops most of the remainder. This comparison of the zooplankton is confined to the two dominant copepods. Their mean standing crop, seasonal variation in numbers of the major divisions in their life histories and some relevant comparisons of reproduction are presented. Filter-feeders are relatively insignificant. (Jones-Wisconsin)
W73-13732

PLANKTON COMPOSITION IN RELATION TO NUTRIENT INFLOW IN A SMALL NEW ZEALAND LAKE,
V. M. Stout.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p. 605-612, 1972. 5 fig., 1 tab, 3 ref.

Descriptors: *Physicochemical properties, *Plankton, *Nutrients, *Inflow, Springs, Lakes, Agricultural runoff, Swamps, Streams, Silica, Phosphorus, Nitrogen, Water temperature, Diatoms, Chlorophyll, Dominant organisms, Seasonal, Chlorophyta, Light intensity, Rotifers, Crustaceans.
Identifiers: *Lake Grasmere (New Zealand), Diatoma.

Major inlets to Lake Grasmere, New Zealand, are compared physically and chemically. Temperatures, fluctuations in silica, total phosphorus and total organic nitrogen in the lake, secchi disc readings, chlorophyll-a and comparative fluctuations in dominant phytoplankton species are described. There are three periods of more abundant phytoplankton growth: a winter peak of Diatoma, a spring growth mainly of green algae, and a summer peak of three different species of diatoms. The zooplankton in Lake Grasmere in winter consist almost entirely of rotifers, and these increase in numbers in the spring. Thus, there is a seasonal succession in the zooplankton with rotifers dominant from late autumn until spring and Cladocera abundant over the warmer months. Fluctuations in the levels of the important nutrients, such as silica, phosphorus and nitrogen, in the inlet waters may cause variations in plankton composition, both in kinds of species present and in the total amount of plankton. Besides those investigated, there may also be an important contribution of other nutrients, such as trace elements. The amounts of nutrients in the inlet waters will vary from year to year and may cause corresponding changes in plankton succession. (Jones-Wisconsin)
W73-13733

BIOASSAY AND CHEMICAL COMPOSITION OF SOME CARPATHIAN RIVERS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
M. Bombowna, and H. Bucka.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 735-741, 1972. 2 fig., 3 tab., 4 ref.

Descriptors: *Bioassay, *Chemical analysis, *Rivers, *Productivity, Eutrophication, Analytical techniques, Algae, Reservoirs, Biological communities, Forecasting, Indicators, Nutrients, Calcium, Magnesium, Photosynthesis, Systematics, Limiting factors, Scenedesmus, Diatoms.
Identifiers: *Poland (Carpathian rivers), Upper Wisla (Poland), Goczalkowice Reservoir (Poland), Skawa River (Poland), Raba River (Poland), Dunajec River (Poland), Ankistrodesmus pseudomirabilis, Scenedesmus acutus, Fragilaria capucina.

Potential productivity of Carpathian rivers, Upper Wisla above its influx into Goczalkowice Reservoir and its three right affluents, Skawa, Raba and Dunajec was measured. Whether the high content of nutrient compounds, a higher calcium and magnesium content are good indicators of larger potential river productivity at the given moment was checked. A chemical analysis of the water was made and the amount of the given test organisms, as well as the intensity of their photosynthesis was estimated. Attention was paid to elimination of nutrient compounds, alteration of pH value, amount of algal suspension precipitated on the membrane filters dried at 40C, and chlorophyll content. Accurate measurements of photosynthetic intensity in all the tests were made, and supplemented by the determination of primary production. Possible decreases of nutrient compounds in future dam reservoirs can be examined on the margin of bioassays characterizing the potential river productivity. The comparison of the rivers shows that rivers with a similar chemical composition may have different influence on algal growth. Therefore the chemical analysis completed by the algal test and microrespirometric methods seems the most useful in river investigations. (Jones-Wisconsin)
W73-13734

CORRELATION BETWEEN DISSOLVED OXYGEN AND PHYTOPLANKTON IN THE LOWER REACHES OF VOLTA LAKE, GHANA,
S. Biswas.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p. 622-627, 1972. 3 fig., 5 tab, 10 ref.

Descriptors: *Correlation analysis, *Dissolved oxygen, *Phytoplankton, *Africa, Photosynthesis, Density, Mathematical studies, Distribution, Variability.
Identifiers: *Volta Lake (Ghana).

In deep lakes the photosynthetic oxygen release is usually due to phytoplankton. Though significant correlation between oxygen and phytoplankton may be observed as expected, it is not necessarily a certainty. Observations on the lower reaches of Volta Lake, Ghana, have shown that significant correlations may or may not be obtained according to the way data are expressed. Vertical distribution of dissolved oxygen and phytoplankton was recorded weekly offshore over a year. Oxygen was determined iodometrically and expressed as percentage saturation. Both living and dead phytoplankton organisms were counted, the distinction being based on the presence or absence of healthy cell contents. Data were expressed both as living organism density and their percentage in a total of living and dead. Expected correlation between oxygen and phytoplankton was supported by actual observations. The partial correlation coefficients were significant when depth was eliminated and hence the observed correlation was not a spurious one. It was also practically linear as data closely approximated the fitted line of regression. Percentage of living phytoplankton but not its density correlated significantly with dissolved oxygen. Data show that a high density does not necessarily mean a high proportion of photosynthetically active organisms. (Jones-Wisconsin)
W73-13735

NEW PARASITE RECORDS FOR LAKE ERIE FISH,
Department of Lands and Forests, Maple (Ontario). Research Branch.
A.O. Dechtiar.
Great Lakes Fish Comm Tech Rep. 17 p 1-20. 1972.
Identifiers: Lake Erie, Acanthocephala, Aspidocotylea, Cestoda, Crustacea, Digenea, Fish, Hirudinea, Lakes, Mollusca, Monogenea, Nematoda, *Parasites, Protozoa, Virus.

During 1961-1969 inclusive, 1112 fish representing 46 spp., were examined for parasites. Fish were taken mainly from the Port Dover areas in the eastern end, and from the Wheatley area in the western end of Lake Erie. Of the fish, 96% were infected by a least 1 sp of parasite. This study adds 96 new records, including several new spp., to the parasite fauna of Lake Erie fish, bringing the present known total to 215 spp. The parasites included a virus, Protozoa, Monogenea, Aspidocotylea, Digenea, Cestoda, Nematoda, Acanthocyphala, Hirudinea, Crustacea and Mollusca.--Copyright 1973, Biological Abstracts, Inc.
W73-13749

NETWORK PLANNING AND DESIGN: PART B, NETWORK DESIGN FOR OBSERVATION OF WATER QUALITY, SEDIMENT TRANSPORT, GROUND WATER, AND SOIL MOISTURE.
For primary bibliographic entry see Field 02A.
W73-13772

EVALUATION OF ECOLOGICAL EFFECTS OF RECENT LOW WATER LEVELS IN THE PEACE-ATHABASCA DELTA,
H. J. Dirschl.
Can Wildl Serv Occas Pap. 13. p 3-28. 1972. Illus.
Identifiers: Calamagrostis-Spp, *Canada (Peace-Athabasca delta), Deltas, *Ecological effects, Fen, Herbaceous, Peace River, Phragmites-Communia, Vegetation, *Water levels, Willow.

Concern about the ecological effects of the altered water regime of the Peace-Athabasca Delta, following completion of the W. A. C. Bennett Dam on the Peace River, led the Canadian Wildlife Service in 1968 to initiate an ecological study. A preliminary account is presented of study of plant succession on exposed silt surfaces. Techniques are discussed which were used to (1) classify and map the delta's landscape according to homogeneous units and (2) examine the distribution of those landscape units in relation to topography and moisture regime. The ecological character of the Peace-Athabasca Delta is determined by the flat terrain and the unique hydrological regime formed by the lower Peace River, and by Lake Athabasca and its outflow channels. Vegetation pattern and animal life in the delta have developed in response to a fluctuating water regime and thus are adapted to it. The germination of seeds contained within the silt or distributed by wind has resulted in rapid colonization of the exposed lake bottoms by numerous species of herbaceous fen vegetation and by willow seedlings. If the present water regime continues indefinitely, the observed plant succession will convert most of the exposed lake and marsh bottoms into willow or phragmites (Phragmites communis) thickets and reedgrass (Calamagrostis spp.) meadows. The overall effect of the regulated water regime on the landscape of the Peace-Athabasca Delta appears to represent an acceleration in the natural aging rate of the delta deposits. It will include a simplification of the delta's scenic diversity, a pronounced reduction in the number and extent of water bodies and a diminution of productive shallow marsh and wet meadow environments in proportion to mesic shrub and forest communities.--Copyright 1973, Biological Abstracts, Inc.
W73-13775

SOME EFFECTS OF MYSID INTRODUCTION AND NUTRIENT ENRICHMENT ON A LARGE OLIGOTROPHIC LAKE AND ITS SALMONIDS,
T. G. Northcote.
Verhandlugen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 1096-1106, 1972. 3 fig, 3 tab, 14 ref.

Descriptors: *Eutrophication, Fish management, *Salmonids, *Crustaceans, Phosphates, Fish food organisms, Fisheries, Fish harvest, Zooplankton, Daphnia, Copepods, *Canada, *Oligotrophy, Lakes.
Identifiers: *Kootenay Lake (British Columbia).

Shortly after experimental introduction of mysids into Kootenay Lake, British Columbia, the lake was subjected to heavy nutrient enrichment. The impacts of these events are reviewed, and, where possible, the effect of mysid introduction and nutrient enrichment are distinguished. Evidence is presented strongly indicating an accelerated eutrophication of Kootenay Lake within the recent two decades. Although the introduced population of Mysis relicta rapidly expanded and dispersed throughout the lake during this same period, there seems little likelihood of its involvement in the many changes indicative of eutrophication, except perhaps for some shifts in relative abundance of zooplankton species. Many of the recent limnological changes in the lake probably result from the sharp increase in its nutrient loading, of which phosphates are predominant. Of the three common salmonids in Kootenay Lake, two species, rainbow trout and kokanee, have apparently responded to one or both major changes in the system, the kokanee very obviously so. Although it has not been possible to distinguish clearly the effects of mysid introduction and nutrient enrichment upon Kootenay Lake and its salmonids evidently the latter has not all been deleterious. (Jones-Wisconsin)
W73-13776

BIOGENIC ENRICHMENT OF SOCKEYE SALMON LAKES AND STOCK PRODUCTIVITY,
Washington Univ., Seattle. Coll., of Fisheries.
O. A. Mathisen.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 1089-1095, 1972. 5 fig, 8 tab.

Descriptors: *Fisheries, *Sockeye salmon, *Productivity, *Spawning, *Alaska, Food chains, Predation, Fish harvest, Competition, Fish food organisms, Lakes.
Identifiers: Nushagak District (Alaska).

Diminution of the sockeye salmon runs in Nushagak District, Alaska, is ascribable to several density-dependent factors, because escapement levels computed from historical records were remarkably stable during the last 60 years of commercial fishing operations, while yields were declining. It is increasingly clear that the function of the escapement, in addition to providing eggs, also affects survival in fresh water of the progeny in different ways. Reduced escapements may change freshwater survival rate by altering either food productivity or the biotic predator community and food competitors of physical characteristics of the spawning beds or by an interaction of all. Eventually a lake system must stabilize itself on a lower productivity level, a mechanism which could explain decline of the early average catches. Presumably yields of the magnitude obtained during the peak of the Nushagak fishery could not be sustained without artificial fertilization. Once the effect of biogenic fertilization was reduced, factors like predation will exert more direct control of freshwater survival. A spawner-recruit relationship contained in a simulation model must be based not on fixed parameters, but on parameters expressed as functions of changing productivity. (Jones-Wisconsin)
W73-13777

THE CYCLING OF RADIOACTIVE SEDIMENTS (STRONTIUM-90) IN THE LAKES OF LATVIAN SSR,
G. Andrushaitis, and Z. Kalnina.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 995-1000, 1972. 1 tab, 9 ref.

Descriptors: *Radioactive wastes, *Migration, Sediments, Biological communities, *Strontium radioisotopes, Lakes, Trophic level, Adsorption, Seasonal, Calcium, Plankton, Aquatic plants, Fish, Crustaceans, Copepods, Rotifers, Phytoplankton, Invertebrates, *Lake sediments.
Identifiers: *Latvian SSR.

Concentrations of strontium-90 in water and its uptake by plankton, plants, fish, substrates, and the calcium content of the water were measured in Latvian reservoirs of different trophic states to determine the accumulation and migration of radioactive wastes. Analyses of Sr-90 show that fish--Esox lucius, Perca fluviatilis, Abramis brama--accumulate more Sr-90 in a dystrophic lake than the same species in mesotrophic and eutrophic lakes. In considering different lake types, there was a marked difference between the Sr-90 concentration factor in a dystrophic and that of either eutrophic or mesotrophic lakes. Concentration factor for plankton, water plants, fish and substrates in a dystrophic lake is higher than in mesotrophic and eutrophic lakes, corresponding to their different ionic relationships. Sr-90 concentration in water and its accumulation by hydrobionts and lake substrates changes seasonally. In water it is highest during autumn and winter, lowest during summer. Sr-90 increases during plant vegetation period due to mineral increase. For fish it is higher in spring than autumn. Its increasing or decreasing concentration factor for plankton is connected with change in species and water pH, but for substrates it depends on substrate structure and its displacement. (Jones-Wisconsin)
W73-13778

ON THE USE OF MATERIAL BALANCES FOR THE ASSESSMENT OF SELF-PURIFICATION CAPACITY IN INLAND WATERS, LAKE PAIJANNE AS AN EXAMPLE,
K. M. Lappalainen
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 934-941, 1972. 5 fig, 1 tab, 11 ref

Descriptors: *Self-purification, *Lakes, *Eutrophication, *Mathematical models, Phosphorus, Lignins, Nutrients, Iron, Primary productivity, Phytoplankton, Biomass, Humus, Organic matter, Sedimentation, Nitrogen
Identifiers: *Finland (Lake Paijanne), Material balance.

Some points in formation of a numerical model of self-purification are presented. The material balance investigation of Lake Paijanne, Finland, was started in 1970 to determine the material discharge in different inlets and outlets and at some of the lake's cross-sections. In one upper waterway the influences of two pulp mills and three housing areas are evident in the lignin and phosphorus content; human effluents from Jyvaskyla are shown by a high amount of nutrients. Central Paijanne receives waste from a pulp mill and two housing areas. There seems to be a positive correlation between the sedimentation of P and the Fe content, but the role iron plays in the sedimentary process of phosphorus is not understood. Positive correlation between sedimentation and average amount of primary production and biomass of phytoplankton are shown. Oxygen saturation of the hypolimnion as the sedimentation function at different points of the open lake at the summer's end is given. If the material balance observations and observations of the lake condition are drawn from a sufficient number of lakes, different cases can be fitted into certain classes and within each class a quantitative model for self-purifying function can be formed. (Jones-Wisconsin)
W73-13779

ECOLOGICAL EFFECTS OF STRIP MINING IN OHIO,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
P. Chase.
Available from the National Technical Information Service as E73-10003, $3.00 in paper copy, $1.45 in microfiche. NASA/Goddard Space Flight Center PR 569, SR 309, Bimonthly progress report, January 1973. 3 p. NAS 5-21762.

Descriptors: *Mapping, *Strip mines, *Ohio, Ecology, Terrain analysis, Coal mines, Surveys, Water quality, Monitoring, Reclamation, Appalachian Mountain Region, Satellites (Artificial), *Environmental effects.
Identifiers: Coal deposits.

Monitoring is conducted of the acreage stripped or otherwise disturbed by coal mining operations in southern and eastern Ohio to detect, identify, and map the secondary effects of coal mining (STRIP) on the environment. These include erosion, vegetative stress, and sedimentation in rivers and lakes. The effects of water drainage and mine acid seepage are also of interest. The after-effects of mining operations are to be studied and recovery time and effectiveness with which mined areas are restored to usefulness compared. The stripped areas are easily monitored by ERTS-1. From

ocessing of the CCT's, various stages of recla-
ation may be recognized. One result, significant
a practical application and for cost-benefit anal-
is, is the relative ease with which ERTS-1 will
onitor new and unreclaimed stripping activities
southeastern Ohio and in all of Appalachia. The
dth of new or unreclaimed stripped areas are
ted by band numbers. The shape is quite distinc-
e on the bands and monitoring additional areas
Appalachia without other graphic aids appears
ssible for a trained photo interpreter. (Jones-
isconsin)
73-13780

EVIEW OF SOME DIRECT EFFECTS OF POIL DUMPING ON MARINE ANIMALS,
hode Island Univ., Kingston.
B. Saila, and S. D. Pratt.
: Dredge and Spoil Disposal in Rhode Island
ound, University of Rhode Island Sea Grant,
larine Technical Report No 2, 1972. p 27-30, 1
b. URI contract 98-20-6012.

escriptors: *Dredging, *Water pollution effects,
Marine animals, *Turbidity, *Organic com-
ounds, *Heavy metals, Biochemical oxygen de-
and, Sediments, Particle size.
dentifiers: *Spoil dumping, *Anoxia.

he effects of dredge spoil disposal in Rhode
land Sound were studied. Six types of direct ef-
ct on bottom dwelling and other marine organ-
ms are discussed. The mortality of various types
f organisms due to burial by spoils is reviewed.
he effects of turbidity and anoxia of the near bot-
m waters were also studied. Hydrocarbon and
eavy metal pollution due to spoil dumping is
nalyzed in regard to its effect on marine organ-
ms. The effects of the change in grain-size dis-
ibution are also reviewed. (See also W73-09142)
Ensign-PAI)
W73-13782

EFFECTS OF SPOIL DUMPING ON THE BENTHIC INVERTEBRATES OF THE SOUND,
Rhode Island Univ., Kingston.
S. D. Pratt.
n: Dredge and Spoil Disposal in Rhode Island
Sound, University of Rhode Island Sea Grant
Marine Technical Report No 2, 1972. p 31-42, 2 fig,
tab.

Descriptors: *Dredging, *Environmental effects,
Benthic fauna, Invertebrates, Speciation, Sand,
Silt.
dentifiers: *Rhode Island Sound, *Providence
Harbor (R.I.), *Spoil dumping.

The communities of benthic organisms in the
Rhode Island Sound and Providence Harbor are
studied and the effects of spoil dumping on them is
reviewed. Samples were taken and analyzed of the
faunal assemblages in the spoil area, they had
characteristic diversity index values that could not
be simply interpreted. Some spoil samples had
relatively high values, indicating little disturbance,
while the natural assemblage had extremely low
values. Only a few species were found on the spoil
dump which had been transported from the dredge
area, and only one species in abundant numbers.
Most of the species colonizing the spoil were
members of the surrounding sand-bottom assem-
blage. Although the spoil was generally silty, only
a few colonizing species were recognized as mem-
bers of the offshore silt-bottom assemblage. Am-
petisca agassizi, a tube building amphipod
crustacean that is the dominant species on the
sandy sediments in the dump area was found on
some spoil areas indicating that colonization will
occur when the hydrographic regime is suitable,
independent of the quality of the underlaying sedi-
ment. (See also W73-09142) (Ensign-PAI)
W73-13783

FISHERIES RESOURCES IN THE DUMP SITE AREA,
Rhode Island Univ., Kingston.
S. D. Pratt.
In: Dredge Spoil Disposal in Rhode Island Sound, University of Rhode Island Sea Grant Marine Technical Report No 2, 1972. p 43-45, 2 fig. URI CONTRACT 98-20-6012.

Descriptors: *Dredging, Fishing, *Fisheries, *Fish conservation, Lobsters, Fish.
Identifiers: *Rhode Island Sound, Spoil dumping, Fin fish, Cod, Flounder, Butterfish, Scup.

The types of fisheries in the Rhode Island dump site area and the extent to which each was affected by the spoil dumping was determined. Fin fish, cod, flounder, butterfish and scup are caught by trawling. The major concerns of trawl fishermen were that spoil might be dumped outside the designated area and that it might increase turbidity after storms, reducing fish catches. Lobstermen avoid trapping near the dump site fearing low polluted catches, burial of traps and loss of buoys. Lobster was the least affected fishery and will probably continue on the spoil after dumping ceases. (See also W73-09142) (Ensign-PAI)
W73-13784

HYDROBIOLOGICAL INVESTIGATION OF LAKE LERE AND NEARBY PONDS: III. CLADOCERA AND COPEPODA,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
For primary bibliographic entry see Field 02H.
W73-13795

BIOLOGY OF THE CRUSTACEANS OF LAKE CHAD: II. DIET OF THE PLANKTONIC ENTOMOSTRACA,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort Lamy (Chad).
For primary bibliographic entry see Field 02H.
W73-13796

THE EXTINCTION OF FISH AND ACID WATER,
Oslo Univ. (Norway). Dept. of Limnology.
A. Lande.
Fauna (Oslo), Vol 25, No 2, p 105-110, 1972, Illus, English summary.
Identifiers: *Acid water, Extinction, Fish, *Norway, *Trout, Water analysis.

During the later decades, and especially during the period 1960-65, the trout has become extinct in many lakes and rivers in southern Norway. The increased acidity of precipitation is certainly the main cause. The situation in Bygland, about 100 km north of Kristiansand is described. Some water samples were taken from different lakes and rivers in this area in Oct. 1970 and Oct. 1971. Analyses of pH, conductivity and ionic composition were carried out. The water is very poor in electrolytes, and very often it is the low pH, and not Ca or total ionic concentration that determines the conductivity. It seems that bog lakes, or seepage lakes have less variation in pH than lakes with large amounts of water flowing through, and in such seepage lakes the trout populations can survive.--Copyright 1973, Biological Abstracts, Inc.
W73-13800

WATER NITRATE METHEMOGLOBINEMIA IN CHILDREN AND ADOLESCENTS (IN RUSSIAN),
Kazanskii Gosudarstvennyi Meditsinskii Institut (USSR). Faculty of Pediatrics.
N. I. Petukhov, A. I. Ryvkin, G. G. Gainullin, and V. I. Landysheva.
Gig Sanit, Vol 37, No 3, p 14-18, 1972, English summary.
Identifiers: Adolescents, Blood, Children, Cyanosis, *Nitrates, Pressure, *Well water, *Methemoglobinemia, Public health.

The nitrate content of well water was studied in 3 settlements, as were its effects on the health of 453 persons, aged 6 mo. to 75 yr. When the concentration of nitrates in the water was 23.7-44.6 mg/l (N), water-nitrate methemoglobinemia developed in children and adults, Cyanosis, a fall of the minimal and maximal blood pressure and an increase of methemoglobin content of blood were noted in all sick persons. A rise of 000 pulse rate was noted in children under 6 yr, and an increase of the respiration rate in children under 13 years of age.--Copyright 1973, Biological Abstracts, Inc.
W73-13806

CONTRIBUTIONS TO THE RECOGNIZING OF INFECTIOUS AND PARASITIC DISEASES OF FISHES LIVING IN THE MODERATE BRACKISH WATERS OF ROMANIA (IN RUMANIAN),
Institutul de Cercetari si Proiectari Alimont, Bucharest (Rumania).
R. Georgescu, N. Angelescu, and R. Tilenschi.
Stud Cercet Piscic Inst Cercet Proiect Aliment. 4. p 349-361, 1971, English summary.
Identifiers: *Brackish water, Diseases, Fish infections, *Parasitic diseases (Fish), *Romania.

The fish used for stocking the moderately brackish ponds of the Amara fish farm came from fresh water ecosystems, which are centers of contagious diseases and have a rich and varied parasitic fauna. The evolution of infectious and parasitic diseases in the new environment was studied in 1970. Both kinds of diseases continued to develop. Only 16 species of parasites, with an ectoparasites:endoparasites ratio of 7:9, were found. Earlier studies found 33 species with ectoparasites:endoparasites ± 19:14.--Copyright 1973, Biological Abstracts, Inc.
W73-13810

THE HAEMATOLOGICAL ASSESSMENT OF THE HEALTH OF FRESHWATER FISH: A REVIEW OF SELECTED LITERATURE,
Trent Polytechnic, Nottingham (England).
P. C. Blaxhall.
J Fish Biol. Vol 4, No 4, p 593-604. 1972.
Identifiers: Chromosomal changes, Fishery management, *Hematological studies, *Literature reviews, Pollution, Reviews, *Fish diseases.

Comparisons are drawn with the techniques already widely used in human pathology for the assessment of health and for aid in diagnosis of various diseases and conditions in freshwater fish. The need for information on normal values, and on the conditions under which these were formulated, and the factors affecting them is stressed. The use of hematological values in assessing sublethal concentrations of environmental pollutants and the possibility of chromosomal changes are considered.--Copyright 1973, Biological Abstracts, Inc.
W73-13813

DISTRIBUTION OF EPILITHIC ALGAE ON UPPER REACHES OF YOSHI-GAWA RIVER: III. ECOLOGICAL STUDIES OF EPILITHIC ALGAE IN WINTER IN KONGO-GAWA RIVER, MITSUISHI-CHO, OKAYAMA PREFECTURE, (IN JAPANESE),
For primary bibliographic entry see Field 05B.
W73-13814

EFFECT OF WASTE DISCHARGES INTO A SILT-LADEN ESTUARY, A CASE STUDY OF COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Water Resources.
R. S. Murphy, R. F. Carlson, D. Nyquist, and R. Britch.

Available from the National Technical Information Service as PB-223 009, $3.00 in paper copy, $1.45 in microfiche. Completion Report IWR-26, November, 1972. 26 p, 13 fig, 3 tab. OWRR B-015-ALAS (2).

Descriptors: *Waste assimilative capacity, Waste water treatment, Water pollution effects, *Estuaries, Municipal wastes, *Nutrients, *Alaska, Cold regions, Outlets.
Identifiers: *Cook Inlet (Alas), Low temperature effects.

Cook Inlet, Alaska, located adjacent to Anchorage, Alaska's largest population center has received the area's raw waste discharges for five decades. A program of field measurements and data analysis was carried out to examine the effects of the raw discharge on the Inlet's low temperature, silt laden, highly mixed waters. The physical characteristics studied included temperature, suspended sediments, tidal currents and tidal dispersion. Chemical characteristics included measurements of pH, dissolved oxygen, salinity and nutrients such as silica, nitrogen and phosphorus. The biological characteristics studied were bacteria, plankton and benthic organisms. The study indicated that some pollution had occurred near the outfalls but the Inlet as a whole was extremely low in all usual pollution indicators. Because of the high tidal mixing and heavy sediment concentrations the Inlet water present a very hostile environment and could easily receive additional waste loads with no detrimental effects. Additional treatment of the now primary treated water is unnecessary.
W73-13815

PESTICIDE LEVELS IN WATER AND WILDLIFE OF REELFOOT LAKE, TENNESSEE,
Tennessee Univ., Martin. Dept. of Biological Sciences.
J. W. Henson.
Available from the National Technical Information Service as PB-223 013, $2.75 in paper copy, $1.45 in microfiche. Tennesse Water Resources Research Center, Knoxville, Research Report No 34, 1973. 19 p, 1 fig, 4 tab, 13 ref.

Descriptors: *Pesticide residues, *DDT, Lakes, *Fish, *Wildlife, *Mortality, Water pollution effects, Environmental effects, *Tennessee.
Identifiers: *Reelfoot Lake (Tenn.).

An attempt was made to determine the extent of pollution of waters and fish of Reelfoot Lake (Tenn.) by chlorinated pesticide residues and to determine whether residue accumulation in the tissues of lake-associated animals was a factor in their mortality. Except in winter, water samples from the highly eutrophic lake contained large amounts of organics and/or soil particulate matter which interfered with the analytical methods used. The presence of DDT and its derivative was indicated in low concentrations (up to 15-20 ppt) in those water samples collected during winter months. All fish samples (collected 1971-1973) contained p,p'-DDT and its derivatives at levels ranging from 0.017-49.312 ppm (whole fish, wet-weight basis), but all residue levels were less than 5 ppm except for one channel catfish taken near the mouth of a stream that enters the lake. Aldrin and dieldrin also were found in the tissues of this channel catfish. Mortaility of resident mallard ducks was not determined to be due to pesticide residue accumulation although p,p'-DDE (0.049-0.492) was found in all duck tissues.
W73-13820

SALMONELLA IN THE LAYING HEN. I. SALMONELLA RECOVERY FROM VISCERA, FECES AND EGGS FOLLOWING ORAL INOCULATION,
Louisiana State Univ., Baton Rouge. Dept. of Poultry Science.
For primary bibliographic entry see Field 05B.
W73-13852

FURTHER OBSERVATIONS ON A GROWTH INHIBITING SUBSTANCE PRODUCED BY PANDORINA MORUM,
Kentucky Univ., Lexington. Dept. of Botany.
D. O. Harris.
Research Report (1972). 20 p, 5 tab, 12 ref. OWRR A-018-KY (3).

Descriptors: *Algal toxins, *Inhibitors, *Plant growth, Stability, Enzymes, Photosynthesis, Respiration, Hydrogen ion concentration, Solubility, Algal control.
Identifiers: *Pandorina morum, Volvocaceae, Volvox tertius, Volvox globator, Volvulina pringsheimii.

These studies clearly show that a substance produced by Pandorina morum (a colonial green flagellate) inhibits growth of most members of the Volvocaceae. The substance was relatively stable when exposed to acid, although exposure to a pH of 2.0 for 20 minutes did destroy most of its activity. It was soluble in benzene and chloroform. To gain some insight concerning the possibility that the toxin was proteinaceous, effects of several proteolytic enzymes on the toxin were examined; these enzymes were trypsin, chymotrypsin and pronase. All attempts to degrade or destroy the inhibitor with these common proteolytic enzymes proved to be unsuccessful, which suggests that the substance is not proteinaceous in structure. A critical examination of the molecular size was undertaken using Sephadex gel filtration. The effect of the inhibitor on the rates of both photosynthesis and respiration was measured. A 65% reduction in photosynthetic rate was found, but, in general, respiration rates were unaffected. It is hoped that these studies on the toxin will shed light on a method to control the indiscriminate growth of algae in all water supplies. (Jones-Wisconsin)
W73-13900

THE INFLUENCE OF SIMAZINE ON THE PHOTOSYNTHETIC PIGMENTS OF GREEN ALGAE,
L. N. Paromenskeya, and G. N. Lyalin.
Available from the National Technical Information Service as AD-754 220. Defence Research Information Centre, Translation No. 2992, November 1972. 8 p, 3 fig, 2 tab, 17 ref. Translated from Fiziologiya Rastenii, Vol 15, No 6, p 1002-1007, 1968.

Descriptors: *Triazine pesticides, *Photosynthesis, *Plant pigments, *Chlorophyta, Chlorophyll, Herbicides, Chlorella, Biochemistry.
Identifiers: *Simazine, Carotin, Lutein, Violaxanthin, Chlorella vulgaris, Ankistrodesmus braunii, Chlorosarcina.

The main link in the herbicidal actions of triazines is disturbance of photosynthesis, requiring research into the effect of triazine herbicides on pigments. The amount of chlorophylls a and b, carotin, lutein and violaxanthin and the chlorophyll luminescence spectra were determined after incubation for 2, 7 and 17 days of green algae in a medium either containing or not containing simazine. In cells of the herbicide-sensitive species Chlorella vulgaris and Ankistrodesmus braunii, pigment content, particularly that of lutein, carotin and chlorophyll-a, decreased. In algal suspension on the basis of measurement of chlorophyll luminescence spectra, it was deduced that the observable decrease of chlorophyll with sensitive algae is not directly linked to interaction of the pigment with simazine. In the resistant species' cells (Chlorosarcina), such an interaction takes place by the second day, apparently one reason for detoxication of simazine. It is possible that with triazine herbicides in cells of resistant algae (Chlorosarcina) a combination of simazine with the chlorophyll-albuminous complex takes place. Comparison of luminescence spectra of suspensions of C. vulgaris and Chlorosarcina showed presence of different chlorophyll forms, possibly one reason for high sensitivity of C. vulgaris towards the herbicide. (Jones-Wisconsin)
W73-13901

LEVELS OF CHLORINATED HYDROCARBON IN CATFISH IN ALABAMA, ARKANSAS, FLORIDA, GEORGIA, LOUISIANA AND MISSISSIPPI.
Mississippi State Univ., State College. Dept. of Biochemistry, Mississippi State Univ., State College. Dept. of Entomology, and Mississippi State Univ., State College. Dept. of Zoology.

Available from the National Technical Information Service as COM-72 10669. Dept. of Commerce, Economic Development Administration, Technical Assistance Project Report, April 1972. 44 p, 3 fig, 8 tab, 11 ref, 3 append. DOC 14-17-0002-512.

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Catfishes, *Southeast U.S., Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Monitoring, Analytical techniques, Adsorption, Fish farming, DDT, Tennessee River, Mississippi River, Fish physiology, DDE, DDD, Dieldrin.
Identifiers: Mirex, Toxaphene.

Pesticide residues in commercial catfish in Southeastern United States were monitored and uptake (food and water), tissue distribution, and elimination of selected chlorinated hydrocarbons by channel catfish determined. Virtually every sample contained p,p'-DDE. Its parent compound, p,p'-DDT, appeared in all muscle samples and in 93% of the liver samples. In laboratory studies, catfish were treated in low concentrations of DDT, Mirex or toxaphene in water; water was sampled at 0, 1, 3, and 6 weeks and fish at 1, 3, and 6 weeks to determine pesticide concentration. DDT, Mirex, and toxaphene were dissolved in sufficient hexane to insure complete penetration of commercial catfish food pellets to determine the catfish uptake and release of the insecticides through food. Of tissues assayed, pesticide residues were consistently lower in muscle than in other tissues regardless of route or length of exposure. Highest residue levels were in blood and brain. In water, Mirex was distributed to and retained in muscle to a much lesser extent than was toxaphene and DDT. In all instances, exposure through food resulted in higher residue levels. Biological magnification in the food web represents a more serious threat than residues in water. (Jones-Wisconsin)
W73-13904

NUTRIENT INPUTS AND THEIR RELATIONSHIP TO ACCELERATED EUTROPHICATION IN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske.
Available from the National Technical Information Service as CONF-710735-1. Contribution No 151, July 1971. 23 p, 6 fig, 4 tab, 35 ref. Presented at Third International Symposium for Hydrology Professors, Purdue University, Lafayette, Indiana. AEC COO-2003-15.

Descriptors: *Nutrients, *Eutrophication, *Lake Michigan, Great Lakes, Chlorides, Nitrogen, Phytoplankton, Phosphorus, Trophic level, Silica, Nitrates, Water pollution effects, Limiting factors, Lake Erie, Lake Huron, Lake Superior, Diatoms.
Identifiers: Flushing rate.

To control eutrophication it must be determined what nutrients limit or control accelerated productivity in the Great Lakes. Studies during three investigations show that phosphorus, not nitrogen, is the nutrient whose increased inputs have accelerated eutrophication in Lake Michigan. This is

vident from data on phytoplankton, phosphorus, nd the trophic state of the Great Lakes; on con-ntrations of silica and nitrate nitrogen; and from utrient enrichment experiments with phytoplank-n assemblages from Lake Michigan. Results om the studies conclude that silica depletion will come an increasingly serious problem and that nosphorus pollution has caused an increased de-and by diatoms for available supplies of silica. hese two factors, and probably others, have con-ibuted to the accelerated eutrophication of the ke. Phytoplankton assemblages will change from ose dominated by diatoms to those with increas-g proportions of green and blue-green algae. Due the large volume and long residence time of ater in the lake, there will be a considerable time g before current management practices can ssibly have a large effect on inputs of nosphorus and the imbalance between nosphorus and silica. (Jones-Wisconsin)
73-13905

PPLICATION OF THE OXYGEN METHOD IN LGOTOXIC INVESTIGATIONS,
P. Braginskii.
vailable from the National Technical Informa-n Service as AD-754 941. Defence Research In-rmation Centre Translation No 2991, November 72. 11 p. Translated from Radioactiva Isotopy .C.-Idrosbiol i Metody Sanit. Gibrobiol Akademii auk SSR Zool. Instituta, p 108-116, 1964. 2 fig, 2 b, 25 ref.

escriptors: *Analytical techniques, *Algicides, Organic compounds, Photosynthesis, hlorophyta, Scenedesmus, Chlorella, yanophyta, Benthic flora, Urea pesticides, riazine pesticides, Herbicides, Chlorinated ydrocarbon pesticides, Methodology.
entifiers: *Algotoxicology, Chloracetic acids, 2-dichloronaphthoquinone, Electrometry, Oxygen ethod.

modification of the oxygen method was used, hich basically consists in determining the haracter of the action of substances on algal notosynthesis, in algotoxicology. Suppression or nhancement of photosynthesis, determined by gal oxygen production, may be the most indica-ve characteristic of test substances. The sub-ances tested were herbicides of ureau derivation-nonuron, diuron, and phenuron; herbicides from group of sym. triazine derivatives--symazine and razines; derivatives of the chloroacetic acids--dium salts of 2,4-di- and of trichloroacetic acid; 3-dichloronaphthoquinone; and several new or-nic chlorine compounds. Their effects on green read algae, green single-celled and colonized al-e, blue-green plankton algae, benthic blue-green gae, and blue-green epiphytes were evaluated. se of an electrometric method permits carrying t rapid experiments on the site in unfavorable nditions since very little equipment is required. he speed with which many algicides act on algae bright sunlight permits shortening of the expo-re to 3-4 hours, extremely important in work in tural conditions. Influence of the preparation on notosynthesis of the algal species examined is ex-ressed as the index of divergence, i.e., whether is is positive or negative, photosynthesis is imulated or retarded. (Jones-Wisconsin)
73-13906

FFECT OF EUTROPHICATION ON BOD ESTING UNDER TURBULENT CONDITIONS,
indsor Univ. (Ontario). Dept. of Civil Engineer-g.
or primary bibliographic entry see Field 05A.
73-13909

ADIOCESIUM RETENTION BY RAINBOW ROUT AS AFFECTED BY TEMPERATURE ND WEIGHT,
olorado State Univ., Fort Collins. Dept. of adiology and Radiation Biology.
A. F. Gallegos, and F. W. Whicker.
Available from the National Technical Information Service as COO-115642. (1972), 25 p. 6 fig, 2 tab, 9 ref. AEC AT (11-1)-1156.

Descriptors: *Cesium, *Radioisotopes, Retention, Absorption, *Rainbow trout, *Temperature, *Weight, *Colorado, Lakes, Fish, Mathematical studies, Thermal pollution, Nuclear powerplants, Growth rates, Feeding rates, Productivity, Water pollution effects, Laboratory tests.
Identifiers: Montane lakes, Accumulation pattern, Salmo gairdneri.

A laboratory aquarium system was developed to test effect of water temperature on Cs-137 accumulation pattern for trout stocked in a Colorado montane lake within the range of temperatures expected in the lake during the growing season. Weight instead of age was selected as the second correlate. Cs-134 retention was observed in fish at 5.0, 8.3, 12.7, and 18.3C. Ten fish ranging in live weight from 30 to 200 grams were maintained as active feeders at all temperatures. Some fish resided in the aquarium for more than 200 days without showing signs of ill health. Fish were removed from the aquarium by net for post-injection whole body counting. Weight of each fish was recorded after most radiocesium body burden determinations. Typical radiocesium retention patterns observed for a given temperature are presented. Waters heated from sub-optimum to optimum temperatures by thermal pollution can be expected to increase fish feeding rates and also their retention of radionuclides incorporated into growing tissues. These experiments imply that maximum cesium intake and retention by fish would be achieved at water temperatures which were optimal for food consumption and growth. (Jones-Wisconsin)
W73-13913

THE ROLE OF ORGANIC DEBRIS AND ASSOCIATED MICROORGANISMS IN PELAGIC ESTUARINE FOOD CHAINS,
Maryland Univ., Solomons. Natural Resources Inst.
D. R. Heinle, D. A. Flemer, J. F. Ustach, R. A. Murtagh, and J. A. Mihursky.
Available from the National Technical Information Service as PB-223 016, $2.75 in paper copy, $1.45 in microfiche. Completion Report, (Technical Report No 14), October 1972. 10 p, 4 tab, 3 ref. OWRR B-014-MD (1).

Descriptors: *Detritus, *Copepods, *Estuaries, *Food chains, Reproduction, Bacteria, *Maryland, Foods, Marshes, Productivity.
Identifiers: Eurytemora affinis, Isochrysis galbana, Thalassiosira pseudonana, Chlamydomonas reinhardti, Patuxent River (Md.), Zizenia aquatica.

To ascertain if the copepod, Eurytemora affinis, a suspected detritivore, can utilize detritus or associated microorganisms as a food source, an index of food utilization was established as greatest reproduction, determined by number of egg sacs and eggs per sac. Feeding experiments were conducted using three concentrations of algae, three species of bacteria (isolated from the Patuxent Estuary near the river mouth), and detritus synthesized from wild rice plants, Zizenia aquatica, and dried marsh plants. Both autoclaved and unautoclaved detritus caused more reproduction than starved copepods and less than copepods fed algae. The unautoclaved detritus caused better reproduction than autoclaved detritus. A suspension of clay particles coated with organic matter derived from boiled marsh grass was offered to the copepods. The Eurytemora readily ingested clay particles ranging from about 2 to 15 microns, but disperse suspensions of that material could not be maintained. Some chemical analyses were done on algae and on the dried marsh plants to find if there are gross differences in chemical composition. A site for measurement of detritus flux to and from a marsh was chosen and production of living marsh plants was estimated. (Jones-Wisconsin)
W73-13980

EFFECTS OF SALINE WATERS UPON SURVIVAL OF FISH EGGS AND LARVAE AND UPON THE ECOLOGY OF THE FATHEAD MINNOW IN NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka.
Available from the National Technical Information Service as PB-223 017, $2.75 in paper copy, $1.45 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report WI-221-013-72, January 1972. 11 p. OWRR A-027-NDAK (1).

Descriptors: *North Dakota, *Fish reproduction, *Fish, *Salinity, Fish eggs, Larvae, Minnows, Pikes, Walleye, Fry, Fish farming, Ducks (Wild), Fish diets, Animal growth, Dissolved solids, Growth rates, Fish food organisms, Fish diseases.
Identifiers: *Pothole lakes, *Fathead minnow, Lake Ashtabula (N.D.), Garrison Diversion Project (N.D.), Ligula intestinalis.

Because North Dakota saline pothole lakes offer a good potential for fish culture and the anticipation of increased salinity from return flows from the Garrison Diversion Irrigation Project, salinity tolerance of the fathead minnow, northern pike, and walleye were evaluated. Also studied was the influence of the levels of dissolved solids on egg and sac fry survival and the fathead minnow's food habits. Laboratory experiments indicated that in water of 1300 micromhos, eggs of fathead minnow, northern pike and walleye hatched well, but when salinity reached 4000 micromhos, there was no hatching of walleye, a very poor hatch of northern pike eggs, but a good hatch of fathead minnow eggs. No northern pike sac fry survived in water of 6000 micromhos and all fathead minnow sac fry (about 1%) surviving in 12,000 micromhos had physical abnormalities. Water in saline lakes with an early summer total dissolved solid concentration of 7000 ppm was not detrimental to fathead minnow reproduction and growth. Fathead minnows consume food similar to several duck species inhabiting the pothole lakes. (Jones-Wisconsin)
W73-13981

STUDIES OF THE HELMINTH FAUNA OF NORWAY: XX. SEASONAL CYCLES OF FISH PARASITES IN THE GLOMMA,
Zoologisk Museum, Oslo (Norway).
For primary bibliographic entry see Field 02I.
W73-14007

A PROBABILISTIC APPROACH TO THE DYNAMICS OF NATURAL POPULATIONS OF THE CHYDORIDAE (CLADOCERA, CRUSTACEA),
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 02H.
W73-14057

EVALUATION OF POTENTIAL RISK OF BOTULISM FROM SEAFOOD COCKTAILS,
California Univ., Berkeley. Lab. for Research in the Canning Industries.
P. Lerke.
Applied Microbiology, Vol 25, No 5, p 807-810, May 1973. 3 tab, 10 ref.

Descriptors: *Evaluation, *Shellfish, *Toxicity, *Botulism, Crabs, Shrimp, Hydrogen ion concentrations, Toxins, Anaerobic bacteria, Pathogenic bacteria, Marine bacteria, Temperature, Organic acids, Laboratory tests.
Identifiers: *Seafood, *Clostridium botulinum E, Sample preparation, Cancer magister, Pandalus jordani, Citric acid, Acetic acid.

Freshly cooked and peeled meat of the Pacific Coast crab Cancer magister or the coastal shrimp (Pandalus jordani) was used to determine the risks of botulism from seafood cocktails. The meat was homogenized in a blender with an equal weight of water containing NaCl and sucrose. An equal mixture of citric and acetic acids were used to adjust pH, after which the homogenate was placed in test tubes, autoclaved and cooled. Tubes of crab meat and shrimp homogenates were inoculated with C. lootulinum E in six runs and four runs, respectively, and peroidically tested for toxin. Crab leg muscles were inoculated with about 10,000 spores, placed in sauces of different pH values, stored at 10, 24, and 30C, and periodically tested for toxin. Leg muscles were also tested for acid penetration. Clostridium botulinum E could not be detected in 35 samples of commerical seafood cocktails, ranging in pH from 4.10 to 4.85. At 30C, toxinogenesis in homogenates acidified with a citric-acetic acid mixture was prevented at pH 4.86 or lower for crabmeat and at 5.03 or lower for shrimp. Measurements of the rate of acid penetration into the centers of large pieces of flesh indicated that the already small risk of botulism from seafood cocktails could be completely eliminated by using a cocktail sauce at a maximum pH of 3.70 and by cooling the final product to at least 10C for 24 h. (Holoman-Battelle)
W73-14062

FERMENTATION OF GLUCOSE, FRUCTOSE, AND XYLOSE BY CLOSTRIDIUM THERMOACETICUM: EFFECT OF METALS ON GROWTH YIELD, ENZYMES, AND THE SYNTHESIS OF ACETATE FROM CO2,
Georgia Univ., Athens. Dept. of Biochemistry.
J. R. Andreesen, A. Schaupp, C. Neurauter, A. Brown, and L. G. Ljungdahl.
Journal of Bacteriology, Vol 114, No 2, p 743-751, May 1973. 4 fig, 4 tab, 54 ref.

Descriptors: *Heavy metals, *Growth rates, *Enzymes, *Fermentation, Clostridium, Metabolism, Cultures, Manganese, Boron, Zinc, Aluminum, Nickel, Copper, Water pollution effects, Toxicity, Carbon dioxide, Synthesis, Bioassay.
Identifiers: *Clostridium thermoaceticum, Xylose, Fructose, Glucose, Culture media, Sugars, Selenium, Corrinoids, Acetates, Biosynthesis.

Clostridium termoaceticum ferments xylose, fructose, and glucose with acetate as the only product. In fermentations with mixtures of the sugars, xylose was first fermented, then fructose, and last, glucose. Fructose inhibits the fermentation of glucose, and this inhibition appears to be due to a repression of the synthesis of an enzyme needed for glucose utilization. Addition of metals to the culture medium increased the cell yield drastically from about 7 to 18 g per liter, and Y (glucose) values between 40 and 50 were obtained. According to the postulated pathways of the fermentation of glucose and synthesis of acetate from CO2 by C. thermoaceticum, 3 mol of ATP are available as energy for growth. Thus a Y (adenosine 5'-triphosphate) of 13 to 16 is obtained. Because the normal Y (ATP) value is 10.5, this could mean that an additional source of ATP is available by an unknown mechanism. The addition of metals also increases the nicotinamide adenine dinucleotide phosphate-dependent formate dehydrogenase activity, the overall reaction (C-14-labelled CO2 to acetate), and the incorporation of the methyl group of 5-methyltetrahydrofolate into acetate. These reactions are catalyzed very efficiently by cells harvested in early growth, whereas cells obtained at the end of a fermentation have very low formate dehydrogenase activity and capacity to incorporate CO2 into acetate. Enzymes present were not or were very little affected by the addition of metals to the growth medium. The amount of corrinoids in cells from early growth is low, hwereas it was high in delta-aminolevulinate dehydratase, which is high at the beginning of growth and low at the end. (Little-Battelle)
W73-14063

THE SELECTIVE TOXICITY OF ANTIMICROBIAL NITROHETEROCYCLIC DRUGS,
North East London Polytechnic (England). Dept. of Applied Biology.
D. I. Edwards, M. Dye, and H. Carne.
Journal of General Microbiology, Vol 76, No 1, p 135-145, May 1973. 9 fig, 1 tab, 25 ref.

Descriptors: *Inhibition, *Growth rates, *Clostridium, *Protozoa, Cultures, Pathogenic bacteria, Antibiotics (Pesticides), *Toxicity.
Identifiers: Metronidazole, Dimetridazole, Tinidazole, Nitrofuran, Gas evolution, Clostridium welchii, Clostridium tertium, Clostridium bifermentans, Clostridium pasteurianum, Clostridium sporogenes, Clostridium histolyticum, Clostridium tetanomorphum, Clostridium butyricum, Trichomonas vaginalis, Viable counts.

Three antimicrobial nitroimidazole drugs (metronidazole, dimetridazole, and tinidazole) inhibit a range of clostridia (C. welchii, C. tertium, C. bifermentans, C. pasteurianum, C. sporogenes, C. histolyticum, C. tetanomorphum, C. butyricum) and the protozoan Trichomonas vaginalis; they have an identical site and mode of action as specific electron acceptors from the pyruvate phosphoroclastic reaction. Analogues of the drugs are compared and the structural requirements for activity explained. The nitrofuran (nitrofurazone) probably has a different mechanism of action. (Little-Battelle)
W73-14064

UTILIZATION OF HYDROCARBONS BY CLADOSPORIUM RESINAE,
Dayton Univ., Ohio. Dept. of Biology.
L. Cofone, Jr., J. D. Walker, and J. J. Cooney.
Journal of General Microbiology, Vol 76, No 1, p 243-246, May 1973. 1 tab, 13 ref.

Descriptors: *Cultures, *Microbial degradation, *Organic compounds, *Pesticides, Fungi, Growth rates, Aldrin, Dieldrin, DDT, Bioassay, Aquatic fungi, Phenols, Water pollution effects, Diazinon.
Identifiers: *Cladosporium resinae, Rotenone, Malathion, Organic acids, Fate of pollutants, Glucose, Alkanes, Hexane, Heptane, Octane, Nonane, Decane, Undecane, Dodecane, Tridecane, Tetradecane, Pentadecane, Hexadecane, Nonadecane, Paraffin oil, Alkenes, Hexene-1, Octene-1, Decene-1, Dodecene-1, Tetradecene-7, 2-methyl undecane, 2 6 11-trimethyl dodecane, Cyclohexane, Cyclohexene, Aromatic hydrocarbons, Benzene, m-Toluic acid, p-Toluic acid, Benzoic acid, Catechol, Salicyclic acid, DL-Mandelic acid, Toluene, o-Xylene, m-Xylene, p-Xylene, Isopropylbenzene, Naphthalene, Anthracene, Phenanthrene.

Cladosporium resinae occurs in air, soil, and water and is capable of growing on hydrocarbons. Two strains were cultured with various hydrocarbons and with aldrin, dieldrin, diazonin, rotenone, malathion, and DDT to study their ability to degrade hydrocarbons. Fungal cells were harvested after 34 days from cultures showing growth. Cultures showing no growth were incubated for an additional 23 days. The fungus grew at various rates on the following hydrocarbons as the sole source of carbon: glucose, hexane, heptane, octane, nonane, decane, undecane, dodecane, tridecane, tetradecane, pentadecane, hexadecane, nonadecane, octene-1, decene-1, dodecene-1, tetradecene-7, 2-methyl undecane, cyclohexane, cyclohexene, benzene, toluene, o-xylene, m-xylene, and isopropylbenzene. Paraffin oil, hexene-1, 2, 6, 11-trimethyl dodecane, m-toluic acid, p-toluic acid, benzoic acid, catechol, salicyclic acid, DL-mandelic acid, p-xylene, phenol, naphthalene, anthracene, and phenanthrene did not support growth. C. resinae did not grow with the pesticides as sole carbon source. Growth on glucose or hexadecane was not inhibited by any of the pesticides, and several stimulated growth. Oxygen uptake also was not affected by pesticides. The ability to use a variety of hydrocarbons in the absence of organic nitrogen indicated by the present work, coupled with ability to grow on substrates which are recalcitrant to attack by many other organisms and in the presence of pesticides is consistent with the view that C. resinae can proliferate in ecological niches which cannot be occupied by other organisms. (Little-Battelle)
W73-14065

EXTRACTABLE LIPIDS OF GRAM-NEGATIVE MARINE BACTERIA: PHOSPHOLIPID COMPOSITION,
Georgetown Univ., Washington, D.C. Dept. of Biology.
J. D. Oliver, and R. R. Colwell.
Journal of Bacteriology, Vol 114, No 3, p897-908, June 1973. 1 fig, 9 tab, 67 ref.

Descriptors: *Marine bacteria, *Environmental effects, *Varieties, Chemical analysis, Aging (Biological), Temperature Classification, Pathogenic bacteria, Anaerobic bacteria, Aerobic bacteria, Bottom sediments, Sea water, Kelps, Marine algae, Cultures, Organic compounds, Solvent extractions, Isolation.
Identifiers: *Gram-negative bacteria, *Phospholipids, *Chemical composition, *Chemotaxonomy, Marine environment, Sample preparation, Natural organics, Biochemical characteristics, Substrate utilization, Vibrio algosus, Vibrio marinofulvus, Vibrio alginolyticus, Vibrio parahaemolyticus, Vibrio marinus, Vibrio cholerae, Agrobacterium stellulatum, Achromobacter aquamarinus, Spirillum linum, Pseudomonas perfectomarinus, Pseudomonas, Aeruginosa, Photobacterium fischeri, Arthrobacter marinus, Phosphatidylethanolamine, Phosphatidylglycerol, Diphosphatidylglycerol, Lyso-phosphatidylethanolamine, Thin layer Chromatography, Poly-beta-hydroxybutyrate.

Phospholipid compositions of 20 marine and estuarine bacteria were determined by thin-layer chromatography. Results showed that phospholipids of marine bacteria differed very little from those of nonmarine organisms with phosphatidylethanolamine, phosphatidylglycerol, and diphosphatidylglycerol being the predominant phospholipids in all strains examined. Lyso-phosphatidylethanolamine occurred in significant quantities among a number of the marine bacteria, and two of the isolates contained significant quantities of poly-beta-hydroxybutyrate. Effects of age and growth temperature on the phospholipid composition were also investigated. It is suggested that phylogenetic relationships among bacteria may be correlated with phospholipid composition. (Holoman-Battelle)
W73-14066

POLYNUCLEOTIDE SEQUENCE RELATIONSHIPS AMONG JAPANESE AND AMERICAN STRAINS OF VIBRIO PARAHAEMOLYTICUS,
Maryland Univ., College Park. Dept. of Microbiology.
T. E. Staley, and R. R. Colwell.
Journal of Bacteriology, Vol 114, No 3, p 916-927, June 1973. 4 fig, 5 tab, 38 ref.

Descriptors: *Marine bacteria, *Pathogenic bacteria, Public health, Radioactivity techniques, Varieties, Estuarine environment, Enteric bacteria, Estuaries, Crabs, Crustaceans, E. coli, Pollutant identification, Bioluminescence, Sea water, Isolation.
Identifiers: *Vibrio parahaemolyticus, *Polynucleotides, *DNA, *Chemotaxonomy, Chemical composition, Sample preparation, Vibrio alginolyticus, Vibrio spp, Nucleic acids, Vibrio cholerae, Deoxyribonucleic acid.

Polynucleotide sequence relationships between two reference Vibrio parahaemolyticus strains isolated from Japanese and American gastroenteritis

ıtients were investigated by use of P-32-labeled-NA/DNA reassociation in free solution. In addi-ɔn, these strains were similarly compared with 22 her strains of estuarine and marine vibrios, in-uding 11 strains previously identified as V. ırahaemolyticus (2 Japanese, 1 of unknonw loca-ɔn, and 8 American strains obtained from diverse ɔgraphical locations and sources in North Amer-a), 3 strains of V. alginolyticus, and 8 of Vibrio ɔp. Deoxyribonucleic acid (DNA) from the ɔanese and American gastroenteritis isolates ɔwed high relative levels of intraspecific duplex rmation (92 to 93%) when reassociated, recipro-lly, at 60C. Heterologous DNA duplexes ex-bited thermal elution midpoint (Tm (e)) values ɔmparable to those obtained from homologous ıplexes (88.0) when thermally eluted from ydroxyapatite, thus indicating high base-pair ɔmplementarity. Other V. parahaemolyticus rains showed DNA homologies of 85 percent or eater, with correspondingly high Tm (e) values 6.0 to 88.0) for the heteroduplexes formed. DNA two of three V. alginolyticus strains (ATCC 749 and 166-70) was 55 to 60 percent ɔmologous to reference V. parahaemolyticus NA preparations; Vibrio sp strain 5144 riginally classified as V. parahaemolyticus bio-pe 2 and subsequently as V. alginolyticus strain 44) showed only 24 to 26 percent DNA homolo-to the same reference DNA. These data provide idence that Vibrio sp strain 5144 is genetically stinct from the other V. alginolyticus strains ed in this study. Three bioluminescent strains ought to be closely related to V. ırahaemolyticus demonstrated only 24 to 31 per-nt DNA homology to the reference V. ırahaemolyticus DNA. These data firmly tablish the existence in some Atlantic and Gulf oast estuaries of organisms genetically very milar to V. parahaemolyticus, the causative ent of 'shirasu' food poisoning in Japan. loloman-Battelle)
73-14067

MMONIUM REGULATION IN ASPERGILLUS IDULANS,
lasgow Univ. (Scotland). Dept. of Genetics.
or primary bibliographic entry see Field 05B.
73-14068

XYGEN TOXICITY AND THE SUPEROXIDE ISMUTASE,
uke Univ., Durham, N.C. Dept. of Biochemistry.
M. Gregory, and I. Fridovich.
ournal of Bacteriology, Vol 114, No 3, p 1193-97, June 1973. 4 fig, 1 tab, 13 ref.

escriptors: *Toxicity, *Oxygen, *E. coli, *Re-stance, Enzymes, Enteric bacteria, Aerobic con-tions, Cultures, Soil bacteria, Coliforms, Aero-c bacteria.
entifiers: *Superoxide dismutase, *Sensitivity, Bacillus subtilis, Streptonigrin, Catalases, Func-onal groups, Bacterial physiology.

xygen caused an increase in the amount of su-eroxide dismutase in Escherichia coli B but not in acillus subtilis. E. coli B cells, induced by growth nder 100 percent 02, were much more resistant to e lethal effects of 20 atm of 02 than were cells hich contained the low uninduced level of this nzyme. In contrast, B. subtilis, which could not spond to 02 by increasing its content of superox-e dismutase, remained equally sensitive to yperbarie 02 whether grown under 100 percent 02 aerobically. The catalase in these organisms ex-bited a reciprocal response to oxygen. Thus, the atalase of E. coli B was not induced by 02, hereas that of B. subtilis was so induced. These sults are consistent with the view that superox-e dismutase is an important component of the efenses of these organisms against the toxicity of xygen, whereas their catalases are of secondary nportance in this respect. The ability of reptonigrin to generate 02 (minus) by a cycle of reduction followed by spontaneous reoxidation, has been verified in vitro. It is further observed that E. coli B which contain the high induced level of superoxide dismutase were more resistant to the lethality of this antibiotic, in the presence of oxygen, than were E. coli B which contained the low uninduced level of this enzyme. This difference between induced and uninduced cells was eliminated by the removal of 02. These results are consistent with the proposal that the enhanced lethality of streptonigrin under aerobic conditions may relate to its in vivo generation of 02 (minus) by a cycle of reduction and spontaneous reoxidation. In toto, these observations lend support to the hypothesis that 02 (minus) is an important agent of oxygen toxicity and that superoxide dismutase functions to blunt the threat posed by this reactive radical. (Holoman-Battelle)
W73-14069

NITRATE REDUCTION AND THE GROWTH OF VEILLONELLA ALCALESCENS,
Cornell Univ., Ithaca, N.Y. Div. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-14070

SENSITIVITY OF VIBRIO PARAHAEMOLYTICUS TO COLD IN OYSTERS, FISH FILLETS AND CRABMEAT,
Washington Univ. Seattle. Inst. for Food Science and Technology.
H. C. Johnson, and J. Liston.
Journal of Food Science, Vol 38, No 3, p 437-441, March/April 1973. 3 fig, 4 tab, 24 ref.

Descriptors: *Temperature, *Cold resistance, *Pathogenic bacteria, *Freezing, *Freeze-thaw tests, Shellfish, Marine fish, Pollutants, Thermal stress, Marine bacteria, Enteric bacteria, Crabs, Oysters, Isolation, Pollutant identification, Environmental effects, Regression analysis.
Identifiers: *Vibrio parahaemolyticus, *Seafood, Sensitivity, Survival, Vibrio alginolyticus, Mutants, Sample preservation, English sole, Parophrys vetulos, Pacific oyster, Crassostrea gigas, Cancer magister.

Raw and slightly cooked Pacific oysters (Crassostrea gigas) and, in some instances, crabment (Cancer magister) and fish fillets (Parophrys vetulos) were used to determine if Vibrio parahaemolyticus survives freezing when present naturally in seafood materials. Oysters were contaminated by feeding or injecting the organisms into the digestive tract. Fish fillets and crabmeat were contaminated within Polymylar pouches by pipetting 1 ml of an appropriate dilution onto the surface of the meat and massaging the pouch for even distribution. The inoculated oysters were refrigerated or frozen at 11, 8, 5, 1, -15 and -30C and subsequently stored for varying periods of time at the same respective temperature. Fish and crabmeat were treated in a similar manner, except that only 1, -15 and -30C were utilized. Samples were removed from storage at intervals, thawed at room temperature and the content of V. parahaemolyticus or V. alginolyticus determined by a surface plate count. Duplicate plates for each appropriate dilution were incubated at 37C and/or 43C for 18-20 hr, and counts of V. parahaemolyticus obtained on plates containing 30-300 colonies. Counts were confirmed after an additional 18-20 hr incubation at the appropriate temperature to allow for growth of 'sub-lethally' damaged cells that might not have appeared after the original 18-20 hr of incubation. Only those colonies which conformed to the characteristics of V. parahaemolyticus (or V. alginolyticus) on the appropriate medium were counted. The pattern of death observed in crabmeat appears to be different from that observed in oysters and fish, in that death at 1C and -15C was essentially linear with little evidence of the two-stage mortality seen in oysters and fish fillets. The two strains of V. parahaemolyticus did show a marked two-stage mortality pattern at -30C, although the extent of the first-stage and second-stage death varied; the V. alginolyticus strain yielded an indication of two-stage mortality at -30C. Crabmeat appeared to offer less protection against chilling and freezing lethality to vibrios than either fish or oyster tissue, but further investigations would be required. The results indicate that chilling, freezing, or frozen storage temperatures per se cannot be relied upon to successfully eliminate the organism from seafoods or prevent the health hazard that is presented by V. parahaemolyticus. (Holoman-Battelle)
W73-14072

SUCCESSION: SIMILARITIES OF SPECIES TURNOVER RATES,
Oak Ridge National Lab., Tenn.
H. H. Shugart, and J. M. Hett.
Science, Vol 180, No 4093, p 1379-1381, June 1973. 1 fig, 4 ref.

Descriptors: *Succession, *Biological communities, Turnovers, Ecosystems, Model studies, Aquatic environment, Terrestrial habitats.
Identifiers: *Turnover rates, *Rate coefficients, Laboratory microcosms, Heterotrophy, Autotrophy.

Rate coefficients have been examined for species turnover in published studies on succession to associate community dynamics with succession. The rate coefficients for species turnover (the proportion of species lost per unit time) for successional communities decrease as the communities approach some equilibrium state. This observation makes it possible to determine the parameters of a two-parameter model which quantifies the time variation of successional changes in the second derivative. For all the communities examined the rate coefficient was found to decrease with the age of the community, which indicates a deceleration in the rate of species loss. This pattern applies to heterotrophic and autotrophic successions, aquatic and terrestrial successions, and successions in laboratory microcosms and large natural ecosystems. (Holoman-Battelle)
W73-14073

ABNORMAL SHAPE CHANGE BY NITZSCHIA PALEA IN CULTURE, (ABNORMALER FORMENWECHSEL VON NITZSCHIA PALEA IN KULTUR),
National Inst. for Water Research, Pretoria (South Africa).
K. von Cholnoky-Pfannkuche.
Nova Hedwigia, Vol 21, Nos 2-4, p 883-886, 1971. 9 fig, 7 ref.

Descriptors: *Chrysophyta, *Cultures, *Essential nutrients, *Plant morphology, Diatoms, Plant pathology, Environmental effects, Deficient elements, Aquatic algae.
Identifiers: *Nitzschia palea, Chemical concentration.

In cultures of Nitzschia palea cultivated for a number of years, the following abnormalities were observed: the length of the valvae diminished and finally measured only 6.5-10 microns, but the breadth did not change. The cell divisions were also disturbed. The daughter cells were at various places irregularly indented, but the genotypically determined characteristics of Nitzschia palea remained unchanged. A change in the nutrients did not influence the length of the cells, but an increase of the SiO2-concentration resulted in more normal shape of the valvae. (Holoman-Battelle)
W73-14074

EFFECT OF THE CHEMICAL COMPOSITION OF THE MEDIUM ON THE GROWTH OF CHLORELLA PYRENOIDOSA,
Instytut Zootechniki, Oswiecim (Poland) Samodzielna Pracownia Biologii Ryb i Strodowiska Wodnego.
J. Zarnowski.
Acta Hydrobiologica. Cracow., Vol. 14, No 3, p 215-223, 1972. 1 fig, 4 tab, 18 ref.

Descriptors: *Growth rates, Chlorophyta, Aquatic algae, Cultures, Plant growth, Nutrients, Biomass, Essential nutrients.
Identifiers: *Culture media, *Substrate utilization, *Chlorella pyrenoidosa, *Chemical composition, Culturing techniques, Ethylenediaminetetraacetic acid.

A study was conducted to observe the intensity of growth of Chlorella pyrenoidosa on 16 media selected from the literature, and to investigate the effect of different EDTA concentrations in the medium on the algal culture growth rates measured by the number of cells/ml and the weight of dry matter. Pure cultures of Chlorella were used and the same concentration of microelements was used in all media. The culture was grown under non-sterile conditions with a temperature of 24 plus or minus 2C for 14 days under an illumination of 7.500 lux for 16 hr/day. Simultaneously, the culture was aerated with air enriched with CO2 to prevent sedimentation of algae and to intensify the photosynthetic process. Before the beginning and end of culturing, amounts of N, P, and K in the media were determined. Four media (Kanazawa, Myers, Tamiya, and Warburg) were selected because of the intensive growth observed and each used in four combinations: without EDTA and with 7, 37, and 100 mg EDTA/l of culture. Cultural conditions were the same except the temperature range was 19-22C. Of the investigated media those of Kanazawa and Tamiya ensured the most intensive growth of Chlorella. The best utilization of nutrients by the Chlorella cultures was observed on the Tamiya medium. Ethylenediaminetetraacetic acid (EDTA) stimulated the growth of the alga cultures. (Holoman-Battelle)
W73-14076

INOCULATION TECHNIQUES--EFFECTS DUE TO QUALITY AND QUANTITY OF INOCULUM,
Hochschule fuer Bodenkulture, Vienna (Austria). Institut fuer Angewandte Mikrobiologie.
For primary bibliographic entry see Field 05A.
W73-14077

CHEMICAL RESPONSE OF UTAH LAKE TO NUTRIENT INFLOW,
Brigham Young Univ., Provo, Utah.
J. S. Bradshaw, R. B. Sundrud, D. A. White, J. R. Barton, and D. K. Fuhriman.
Journal Water Pollution Control Federation, Vol 45, No 5, p 880-887, May 1973. 5 fig, 2 tab, 20 ref.

Descriptors: *Water analysis, *Nutrients, *Sewage effluents, *Water pollution effects, *Inflow, Chemical analysis, Water chemistry, Physical properties, *Utah, Chemical properties, Laboratory tests, Waste water (Pollution), On-site tests, Biochemical oxygen demand, Carbon dioxide, Secchi disks, Turbidity, Coliforms, Hydrogen ion concentration, Phosphates, Nitrates, Nutrients, Bicarbonates, Chlorides, Sulfates, Ammonia, Calcium.
Identifiers: *Utah Lake, Provo Bay, Chironomids.

Utah Lake, Provo, Utah, is a large shallow lake that receives the effluents from nine waste water treatment plants. Provo Bay, an eastern extension of Utah Lake, receives much of the total volume of these effluents. A study was undertaken to determine the effect of the added nutrients on the chemistry and biota of Utah Lake. Established sites were sampled weekly during the summer months and periodically during the winter using either a boat or snowmobile. On-site measurements were made for DO, carbon dioxide, pH, turbidity. Laboratory tests included those for BOD, coliform density, phosphates, nitrates, ammonia, Ca, Mg, Na, K, chloride, bicarbonate, and sulfate. During the summer months, large chemical changes take place as the water that enters with high concentrations of nutrients moves through Provo Bay. These nutrients are effectively removed by the great algal bloom in the center of Provo Bay. Part of the carbon needed for algal growth is supplied by the great amount of bicarbonate in the Utah Lake water. (Holoman Battelle)
W73-14081

BEHAVIOR OF YOUNG ATLANTIC SALMON (SALMO SALAR) EXPOSED TO OR FORCE--FED FENITROTHION, AN ORGANOPHOSPHATE INSECTICIDE,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
P. E. K. Symons.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 651-655, May 1973. 1 fig, 11 ref.

Descriptors: *Atlantic salmon, *Fish behavior, *Phosphothioate pesticides, *Water pollution effects, Juvenile fish, Organophosphorus pesticides, Insecticides, Fish physiology, Food habits, Bioassay.
Identifiers: *Fenitrothion, *Parr, Locomotion, Salmo salar, Pollutant effects.

Exposure of young Atlantic salmon (Salmo salar) to 1.0 ppm fenitrothion for 15-16 hr caused a 50 percent decrease in the number holding territories 6 days following treatment. Some severely affected fish also swam stiffly and ceased feeding, but these effects disappeared within 48 hr following return to clean water. Territories were not reclaimed for approximately 2-3 weeks. Exposure to 0.1 ppm fenitrothion for 15-16 hr caused a lesser (20 percent) reduction in numbers of fish holding territories. When mealworms (Tenebriosp) injected with 2-5 microliters pure (100 percent) fenitrothion were force-fed to young salmon, 50 percent were regurgitated 8-12 hr afterwards. Almost all mealworms containing 10-20 microliters fenitrothion were regurgitated. The proportion of worms regurgitated remained constant during a week of daily force-feedings but, 24 hr after the third or fourth feeding, all fish except controls could be made to flex tetanically by rapping on the aquarium, and they made little attempt to escape a dipnet. (Holoman-Battelle)
W73-14083

LAND DISPOSAL AND SEWAGE EFFLUENT: APPRAISAL OF HEALTH EFFECTS OF PATHOGENIC ORGANISMS,
Hahnemann Medical Coll. and Hospital, Philadelphia, Pa.
M. A. Benarde.
Journal of the American Water Works Association, Vol 65, No 6, p 432-440, June 1973. 7 fig, 43 ref.

Descriptors: *Water reuse, *Sewage disposal, *Public health, *Potable water, *Reviews, *Human diseases, Pathogenic bacteria, Reclaimed water, Waste water (Pollution), Irrigation, Waste disposal, Salmonella, Viruses, Soils, Path of pollutants, Waste water disposal, Domestic wastes, Municipal wastes, Sewage, Coliforms, Epidemics, Water pollution effects, Shigella.
Identifiers: Land disposal, Fecal pollution.

Concern about pollution of surface waters, especially by human and animal fecal wastes has evoked interest in alternate methods of disposal of these waters as well as in the reuse of waters. The literature concerning possible health hazards a the advantages of disposing fecal wastes on land reviewed. Although many questions remain to b answered, reuse of water and land disposal treated fecal wastes should pose no health threat if proper regulations are established and followed. Waste waters may in the future be used as a sourc of drinking water. (Little-Battelle)
W73-14087

MERCURY AND OTHER TRACE METALS I THE ENVIRONMENT. A COMPILATION O FEDERAL GOVERNMENT RESEARCH PRO JECTS AND SURVEYS AUGUST 1971.
Department of Energy, Mines and Resources Burlington (Ontario) Canada Center for Inlan Waters.
For primary bibliographic entry see Field 05B.
W73-14089

POLYCHLOROBIPHENYLS (PCBS) AND RE LATED CHLOROPHENYLS: EFFECTS O HEALTH AND ENVIRONMENT. I. BIBLIOG RAPHY 1881-1971,
Oak Ridge National Lab., Tenn. Toxicology Information Response Center.
G. E. Quinby.
Available from the National Technical Informa tion Service as PB-209 944. Report Nos. TIRC-1 ORNL-EIS-72-20, April 1972. 140 p, 870 ref. Con tract No. NLM Interagency Agr. No. 40-274-71.

Descriptors: *Polychlorinated biphenyls *Bibliographies, *Documentation, *Reviews Public health, Water pollution effects, Analytica techniques, Pollutant identification, Pollutants Toxicity, Ecology, Water pollution, Eggs, DDT Fish, Insecticides, Poisons, Lethal limit, Bioas say, Absorption, Water pollution sources, Chemi cal analysis, Sea water, Aquatic environment Animal pathology, Disease, Methodology, Mor tality, Pesticide residues, Sealants, Silage Chlorinated hydrocarbon pesticides, Oil, Path o pollutants.
Identifiers: *Pollutant effects, *Chlorophenyls Animal tissues, Hexachlorobenzene, Detection limits, Bioaccumulation, Atomic absorption spec trophotometry, Lubricating oil, Toxicology Marine environment, Carcinogens, Chemica structure, Vegetable oils, Fate of pollutants Cutting fluids, Body fluids, Industrial hygiene.

Medical and public health interest i polychlorobiphenyls (PCBs) in the United State was meager before 1970. The expanding literatur since then has reflected the realization of the im portance of these substances as environmenta pollutants. The analytical confusion of PCB with DDT and other chlorinated hydrocarbon pesti cides prior to 1969 is of special interest. The con cern over PCBs was heightened in 1971 by the recognition of gross contamination of certain animal feeds and of trace contamination of some human foods. The 870 articles cited in this bibliog raphy are believed to cover the majority of articles in all languages available through January, 1972 This bibliography is part I of a state-of-the-ar review. Part II will contain the review. (Holoman Battelle)
W73-14091

AN IMPROVED BACTERIAL TEST SYSTEM FOR THE DETECTION AND CLASSIFICATION OF MUTAGENS AND CARCINOGENS,
California Univ., Berkeley. Dept. of Biochemistry.
For primary bibliographic entry see Field 05A.
W73-14094

INTERACTIONS OF TETRAHYMENA PYRIFORMIS, ESCHERICHIA COLI, AZOTOBACTER VINELANDII, AND GLUCOSE IN A MINIMAL MEDIUM,
Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.

. L. Jost, J. F. Drake, A. G. Fredrickson, and H. M. Tsuchiya.
ournal of Bacteriology, Vol 113, No 2, p 834-840, ebruary 1973. 8 fig, 16 ref.

Descriptors: *E. coli, *Food webs, Competition, Food chains, Predation, Trophic level, Model studies, Cycling nutrients, Protozoa, Bacteria.
Identifiers: *Minimal media, *Glucose, Tetrahymena pyriformis, *Azotobacter vinelandii, Continuous cultures, *Species interaction, Substrate utilization, Chemostat, Culture media, Population density.

A study was made of the food web formed from a protozoon, two bacteria, and a glucose minimal medium in chemostat culture. The system was also divided into simpler parts, first by omitting the protozoon to obtain a competition system, and then by omitting one or the other of the bacteria to obtain two food chains. In the competition studies, one bacterium was displaced by the other at all holding times used. In the food chain studies, sustained oscillations of the population densities of predator and prey developed at short holding times, and then changed to damped oscillations at longer holding times. In addition, the level of residual glucose remained high at long holding times. A new model of microbial growth is necessary to explain these results. In the food web studies, predation of the protozoon on the two bacteria stabilized the competition between the latter and allowed their coexistence in the same habitat. Thus, Gause's principle was circumvented. (Holoman-Battelle)
W73-14095

PUBLIC HEALTH ASPECTS OF ORGANICS IN WATER,
California State Dept. of Public Health, Berkeley.
H. J. Ongerth, D. P. Spath, J. Crook, and A. E. Greenberg.
Journal of the American Water Works Association, Vol 65, No 7, p 495-498, July 1973. 23 ref.

Descriptors: *Water reuse, *Public health, *Toxicity, *Organic matter, Reviews, Water analysis, Organic wastes, Waste water (Pollution), Potable water, Water utilization, Pollutant identification, Pollutants.
Identifiers: Characterization, Carcinogenicity, Mutagenicity, Teratogenicity.

Interest in reuse of wastewaters for consumptive purposes necessitates that their components and potential effects be investigated. A literature survey for information regarding characterization of waters for residual organics has shown that very little is known about organic products in water. Even less is known about their effects, individually or in combination, on man. Review of studies that have been conducted revealed that organic compounds are often very complex and difficult to characterize. Toxic effects, especially long-term effects such as carcinogenicity, mutagenicity, and teratogenicity are likewise difficult to determine because of uncertainties in dosages which might occur under natural conditions and because of possible synergistic effects of contaminants. Much information will be needed before water can be reused for consumptive purposes. (Little-Battelle)
W73-14098

ENVIRONMENTAL POLLUTION BY POTASSIUM PLANT WASTES (ZAGRYAZNENIYE OKRUZHAYUSHCHEY SREDY OTKHODAMI KALIYNOGO PROIZVODSTVA),
N. I. Turenkov, and P. F. Zhigarev.
Pochvovedeniye, No 9, p 70-75, September 1972. 4 tab, 11 ref.

Descriptors: *Industrial plants, *Industrial wastes, *Potassium, *Environment, *Water pollution effects, Water pollution sources, Air pollution, Soil contamination, Salinity, Salts, Brines, Chlorides, Vegetation, Surface waters, Water types, Reservoirs.
Identifiers: USSR.

Investigations were conducted in 1969-1971 in the region of the Soligorsk combine 'Beloruskaliy' to study damage inflicted by wastes from potassium concentration plants to soil, vegetation, surface waters, groundwater, and air. Soil around these plants is subjected to salinization by salts from gaseous wastes and by brines carried by rain and melt water from salt dumps. As much as 2.28 meq of chlorides/100 g of soil accumulate in the upper 2-cm layer within a radius of 1 km of the plants. Concentration of chlorides in snowmelt within a radius of 2 km of the pollution source is two or more times their average concentration in the European part of the USSR. Gaseous wastes from concentration plants have a toxic effect on vegetation, particularly potatoes, apples, and cherries, while oats and couch grass are relatively unaffected. As a result of periodic discharge of industrial wastes, chloride concentration in the Soligorsk Reservoir has increased sharply, and at a distance of 10 km from the waste discharge site is 12.5 times the original amount. (Josefson-USGS)
W73-14148

LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYETHYLENE FORMULATIONS OF CHLORPYRIFOS, DECEMBER 1971 - APRIL 1972,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
For primary bibliographic entry see Field 05A.
W73-14184

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A),
Michigan Univ., Ann Arbor. School of Natural Resources.
F. F. Hooper.
Available from the National Technical Information Service as COO-1771-5. Technical Progress Report December 1972. 71 p, 19 fig, 10 tab, 66 ref, 3 append. ORA Project No. 016440, Contract No. AT (11-1)-1771.

Descriptors: *Iron, *Cycling nutrients, *Phosphorus, *Aquatic productivity, *Dystrophy, Hypolimnion, Epilimnion, Connate water, Measurement, Path of pollutants, Leachate, Radioactivity techniques, Organophosphorus compounds, Mosses, Bogs, Lakes, Michigan, Ecosystems, Water sampling, Ions, Pollutant identification, Tagging, Stable isotopes, Surface waters, Anion exchange, Water analysis, Chemical analysis.
Identifiers: *Lake-bog systems, Sphagnum, Phosphorus cycle, Ribonucleic acid, Polyphosphates, Orthophosphates, Ion exchange chromatography, Dissolved organic phosphorus, P-32, Nucleic acids.

Three items concerned with nutrient cycling are discussed: (1) Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System, (2) The Role of Sphagnum in the Cycling of Phosphorus in a Bog-Lake System, and (3) Ionic State and Coordination of Iron in Bog Lakes. The organophosphorus compounds produced in the bog mat were identified as hydrolytic products of ribonucleic acids as well as free mono-, di-, and triphosphate nucleotides. The inorganic P of the epilimnion and the mat waters were chiefly orthophosphate; that of the hypolimnion consisted of ortho- and polyphosphate P. The direct application of P-32 to the surface of Sphagnum produced a leachate consisting entirely of soluble unreactive P which was flushed into the lake (surface water and hypolimnion) when rains created a hydrologic gradient of flow within the mat. P-32 injected directly into the interstitial water of the mat produced a leachate of entirely particulate unreactive phosphorus. This was also flushed into the lake by the action of the rain and persisted in the surface water with little or no loss or transformation for a period in excess of 3 weeks. The presence of ionic Fe (II) without complexation was confirmed as the predominant form of Fe in the deoxygenated waters of the bog according to the sampling methods and reaction scheme used. However, the chemical state of iron present in the lake varied considerably in form and amount with depth. (Holoman-Battelle)
W73-14185

KINETICS OF AMINO ACID INFLUX INTO NITELLA FLEXILIS,
Windsor Univ. (Ontario). Dept. of Biology.
D. G. Wallen.
Journal of Phycology, Vol 9, No 2, p 148-152, June 1973. 3 fig, 1 tab, 24 ref.

Descriptors: *Kinetics, *Absorption, *Amino acids, *Inflow, *Aquatic algae, Radioactivity techniques, Organic acids, Chromatography, Radiochemical analysis, Organic compounds, Aquatic plants.
Identifiers: *Nitella flexilis, Glycine, Alanine, Valine, Arginine, Aspartic acid, Autoradiography, Scintillation counting, Stoneworts.

The uptake of amino acids by Nitella flexilis has been investigated. Separated internodal cells of the alga were placed in artificial pond water to which had been added C-14-labeled L-amino acids (glycine, alanine, valine, arginine, and aspartic acid) to give concentrations up to 30 mM. The experiments were conducted at 20C. At the end of the experiments, the labeled cells were harvested and the radioactivity measured. In some cases, the nature of the C-14-labeled organic compounds was determined. Influx of glycine, alanine, and valine appears to be a diffusive process. Influx ranged from 0.14 to 0.06 and 0.04 pmoles/ (cm) (sec), respectively. Aspartic acid uptake is an active transport mechanisms. The V sub max is 2.8 pmoles/ (cm) (sec); the transport constant (Michaelis constant) K sub m, 0.0078 M. The uptake of arginine is apparently due to 2 transport systems, one with a V sub max and K sub m of 3.1 pmoles/ (cm) (sec) and 0.0032 M, respectively. The second system has a V sub max of 1.4 pmoles/ (cm) (sec) and a K sub m of 0.00021 M. The possibility that the second system is diffusive has been considered. (Holoman-Battelle)
W73-14186

OBSERVATIONS ON THE STRUCTURE OF SOME FORMS OF GOMPHONEMA PARVULUM KUTZ. II. THE INTERNAL ORGANIZATION,
Bristol Univ. (England). Dept. of Botany.
P. A. Dawson.
Journal of Phycology, Vol 9, No 2, p 165-175, June 1973. 25 fig, 41 ref.

Descriptors: *Diatoms, *Plant morphology, *Aquatic algae, *Electron microscopy, *Cytological studies, Chrysophyta, Cultures.
Identifiers: *Gomphonema parvulum, Light microscopy, Ultrastructure, Frustules, Sample preparation, Cell wall, Characterization.

The diatom species Gomphonema parvulum Kutz. was isolated, grown in culture, and the details of the internal organization studied by light and electron microscopy. The organism is usually identified from its frustular morphology, but members of the genus Gomphonema can be separated from other naviculoid forms by the H-shaped chromatophore, whose lobes are connected on 3 sides across the center of the cell, and also from the position of the pyrenoid. This is situated on the inner side of the chromatophore and is not embedded in the center of the chromatophore. New observations of this pennate diatom include details of the periplastidial network, of the Golgi vesicu-

lar activity, and of the storage products. (Holoman-Battelle)
W73-14187

CONTINUOUS CULTURE OF MARINE DIATOMS UNDER SILICATE LIMITATION. I. SYNCHRONIZED LIFE CYCLE OF SKELETONEMA COSTATUM,
Washington Univ., Seattle. Dept. of Oceanography.
C. O. Davis, P. J. Harrison, and R. C. Dugdale.
Journal of Phycology, Vol 9, No 2, p 175-180, June 1973. 5 fig, 3 tab, 42 ref.

Descriptors: *Diatoms, *Deficient elements, *Silicates, *Life cycles, Marine algae, Chrysophyta, Plant growth, Cultures, Plant physiology, Growth rates, Limiting factors, Essential nutrients, Reproduction.
Identifiers: *Synchronization, *Skeletonema costatum, Continuous cultures, Chemostat, Culturing techniques.

Skeletonema costatum was grown in silicate-limited continuous culture. Culture conditions resulted in synchronization of sexual reproduction. A detailed description of the life cycle is presented. During the life cycle growth rates varied from 0 to 0.12/hr. Sexual reproduction in diatoms has often been observed in batch cultures and some stages have been reported in nature. However, this is apparently the first report of its occurrence in continuous culture. Other experiments that demonstrate the importance of sexual reproduction in continuous culture work are discussed. (Holoman-Battelle)
W73-14188

PH AND EH CONTROL OF CULTURES OF SULPHATE-REDUCING BACTERIA,
University of Manchester Inst. of Science and Technology (English).
E. B. Brown, G. R. Groves, and J. D. A. Miller.
Journal of Applied Chemistry and Biotechnology, Vol 23, No 2, p 141-149, February 1973. 4 fig, 2 tab, 19 ref.

Descriptors: *Sulfur bacteria, *Hydrogen ion concentration, *Oxidation-reduction potential, *Cultural control, Inhibition, Solubility, Sulfides, Growth rates, Variability, Laboratory tests.
Identifiers: *Batch cultures, *Desulfovibrio vulgaris, Culturing vessels.

Batch cultures of Desulfovibrio vulgaris, carried out in a 5-litre stirred fermenter, are described. Bacterial counts and sulphide formation are reported for experiments carried out under a selection of controlled Eh and pH conditions. Specific growth and sulphide formation rates are determined and compared. Variations in the growth rates under the different controlled conditions are examined and discussed in terms of product inhibition by sulphide. A relatively high specific rate of exponential growth was observed at Eh equals -150 mV and pH equals 6.95, when sulphide inhibition was believed to be at a minimum. (Holoman-Battelle)
W73-14191

ECOLOGICAL CONCEPT OF THE COASTAL ZONE IN THE GREAT LAKES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05B.
W73-14193

PHOTOLYSIS OF ETHYLENETHIOUREA,
California Univ., Davis. Dept. of Environmental Toxicology.
R. D. Ross, and D. G. Crosby.
Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 335-337, May/June 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Absorption, *Aqueous solutions, *Water analysis, Solar radiation, Ultraviolet radiation, Urea pesticides, Water pollution sources, Degradation (Decomposition), Agricultural runoff, Separation techniques, Spectrophotometry, Drainage water.
Identifiers: *Ethylenethiourea, *Photodecomposition, Sample preparation, *Photolysis.

Ethylenethiourea (ETU) occurs as an impurity in and as an alteration product of technical ethylene bisdithiocarbamate fungicides. Its solubility in water suggests that it may occur as a contaminant in agricultural runoff. Therefore studies were conducted on the photodecomposition of ETU by preparing solutions with agricultural drainage or deionized water for exposure to sunlight or ultraviolet light. Decomposition products were isolated and identified by rotating vacuum evaporator and subjecting them to thin-layer chromatography. Separated compounds were detected by UV absorption. ETU was determined by evaporating samples, redissolving in methanol, and measuring absorbance at 239 nm. The results showed that ETU in aqueous solution (0.5-50 ppm) was stable to sunlight. However, in the presence of dissolved oxygen and sensitizers such as acetone or riboflavin, it was rapidly photooxidized via ethyleneurea and glycine sulfate. ETU decomposition also occurred in boiled samples of agricultural drainage waters in sunlight but not in the dark, indicating that natural photosensitizers may play an important part in the environmental transformations of xenobiotics. (Little-Battelle)
W73-14194

EFFECT OF NUTRIENT ADDITIONS ON THE APPARENT COMETABOLISM OF DDT,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
F. K. Pfaender, and M. Alexander.
Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 397-399, May/June 1973. 1 fig, 2 tab, 10 ref.

Descriptors: *Sewage bacteria, *Microbial degradation, *DDT, DDD, DDE, Bioassay, Cultures, Nutrients, Sewage, Metabolism, Water pollution effects, Path of pollutants, Gas chromatography, Separation techniques.
Identifiers: *Cometabolism, *Fate of pollutants, DBP, Biotransformation, Sample preparation, Plate counts.

Raw sewage samples, half of which were autoclaved, were placed in Erlenmeyer flasks and treated with DDT and inorganic salts to obtain additional evidence on the significance of cometabolism in the microbial transformation of DDT. Sets of sterilized and unsterilized samples received additions of glucose or diphenylmethane. One set received no additions. All flasks were incubated at 30C. At periodic intervals, samples were removed and frozen for later extraction and analysis. At the same time, plate counts were made of the bacteria. For analysis, the samples were thawed, acidified with H_3PO_3, and extracted for 6 hours with ethyl ether. Extracts were concentrated with a flask evaporator and esterified by boiling with BC13-methanol. The microbial cultures were extracted in a separatory funnel, with n-hexane-ethyl ether. All extracts were dried, resuspended in acetone, and analyzed by gas chromatography. The products formed by microbiological degradation of DDT were the same as those identified in other studies, namely, DDD, DDE, and DBP (4,4'-dichlorobenzophenone). The addition of glucose enhanced the rate of DDD formation but slowed DBP biosynthesis, and additions of diphenylmethane reduced the rate of formation of both DDD and DBP. The numbers of microorganisms potentially able to cometabolize DDT were high in raw sewage, but their abundance rose markedly as a result of the addition of glucose and diphenylmethane. Many of these microorganisms produced DDD, DDE, and DBP. (Little-Battelle)
W73-14196

MOLYBDENUM TOXICITY: ABNORMAL CELLULAR DIVISION OF TERATOGENIC APPEARANCE IN EUGLENA GRACILIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Veterinary Science.
G. Colmano.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 6, p 361-364, June 1973. 2 fig, 9 ref.

Descriptors: *Molybdenum, *Toxicity, *Cytological studies, Cultures, Heavy metals, Euglenophyta, Phytoplankton, Water pollution effects, Aquatic algae.
Identifiers: *Euglena gracilis, *Teratogenicity, Pollutant effects, Euglena gracilis var. bacillaris, Culture media.

Molybdenum is shown to be involved in the mechanism of cellular division that produces monsters in Euglena. Euglena cells were first grown in a medium containing 5.44 ppm molybdenum. These cells divided by normal fission and had a normal growth rate. When the molybdenum concentration was accidently increased 20 fold, abnormal clusters of three to nine actively moving cells attached to each other at one end appeared. In further experiments, these abnormal forms, accompanied by blue coloration of the culture medium, appeared only with high molybdenum concentrations. Change in concentration of other components affected only the growth rate. Molybdenum may be considered toxic and may be an inhibitor of cellular fission with resultant nuclear and chromosomal polyploidy and abnormal mitoses. A similar toxicity of molybdenum may activate the uncontrolled growth patterns observed in some neoplastic growths. (Mortland-Battelle)
W73-14197

ESTIMATION OF ESTUARINE MARSH PRODUCTIVITY,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-14199

5D. Waste Treatment Processes

COMBINED TREATMENT OF MUNICIPAL WASTEWATER AND ACID MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
F. H. Pearson, and J. B. Nesbitt.
Available from the National Technical Information Service as PB-222 936, $3.00 in paper copy, $1.45 in microfiche. Research Publication No 73, Pennsylvania Institute for Research on Land and Water Resources, Dec, 1972. 43 p, 15 fig, 1 tab, 20 ref, 4 append. OWRR B-042-PA (1). 14-31-0001-3636.

Descriptors: *Mine drainage, *Design, Economics, *Wastewater treatment, *Acid mine water, Recycling, Iron, *Pennsylvania, Cost analysis.
Identifiers: *Combined treatment.

Acid mine drainage (AMD), a serious water pollutant in many states may be an economical source of ferrous iron for the chemical coagulation of municipal wastewater. AMD would then be neutralized by the alkalinity in wastewater. Samples of AMD and raw wastewater were collected from sites in Pennsylvania where AMD was found close to a wastewater treatment plant. The samples were mixed in varying ratios, then processed at controlled pH in a laboratory scale treatment plant that provided flocculation and sedimentation. The optimal pH was 8 for a maximum reduction in phosphorus, ferrous iron, and turbidity. At pH 8 the median reduction in total phosphorus was 95 percent when the molar ratio of ferrous iron to total phosphorous was 2. The median reduction in

BOD was 75 percent when the ferrous iron dose rate was 10 - 20 mg Fe/1, and at pH 8. Ferrous iron was almost completely removed at pH 8. A cost analysis showed that there is a maximum distance for which it is economical to pump AMD for combined treatment with wastewater, beyond which chemical treatment is less expensive.
W73-13656

WASTE WATER TREATMENT FACILITIES, TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio.

Available from NTIS, Springfield, Va. 22151 PB-214 516 Price $6.75 printed copy; $1.45 microfiche. EPA Office of Water Programs, Training Program, July 1971. 261 p.

Descriptors: *Waste water treatment, *Training, *Education, *Publications, Industrial wastes, Municipal wastes, Sewage treatment, Filtration, Flocculation, Trickling filters, Sewage lagoons, Water pollution control, Methodology.
Identifiers: *Wastewater treatment training manual.

This course is intended for planning and management personnel from public and private agencies planning to install new waste water treatment facilities or to undertake major construction to improve existing facilities. Manuals are prepared for reference use of students enrolled in scheduled training courses of the Water Quality Office, Environmental Protection Agency. This manual will be useful to anyone who has need for information on the subjects covered. However, it should be understood that the manual will have its greatest value as an adjunct to classroom presentations. Training is available at five installations of the Agency. These are: the National Training Center located at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio; the Robert S. Kerr Water Research Center, Ada, Oklahoma; the Southeast Water Laboratory, Athens, Georgia; the Pacific Northwest Water Laboratory, Corvallis, Oregon; and the Hudson-Delaware Basins Office, Edison, New Jersey. (Woodard-USGS)
W73-13672

REGIONAL WATER SUPPLY/SEWAGE DISPOSAL PLAN AND SHORT-RANGE PROGRAM, 1973-1978.
Central New York Regional Planning and Development Board, Syracuse.

Available from NTIS, Sprinfield, Va., 22151, PB-217 516, Price $3.50 printed copy; $1.45 microfiche. November 1972. 27 p, 6 fig, 2 append. HUD 246-03.

Descriptors: *Water supply, *Sewers, *Planning, *New York, Urbanization, Water management (Applied), Land use.

Policies are presented of the Central New York Regional Planning and Development Board regarding the concurrent provision of public water and sanitary sewer service, particularly service extensions. The relationship of the sewer and water plans with other functional plans is illustrated. The significant impact that water and sewer systems have on urban development patterns, densities, and sequence is discussed. Major existing water supply and sanitary sewerage facilities necessary to implement the water and sewer plan and the land use plan are listed. These facilities are listed on a regional priority basis. (Knapp-USGS)
W73-13684

COMBINED SAMPLING AND FLOW MEASUREMENT,
For primary bibliographic entry see Field 05A.
W73-13708

REMOVAL OF PHOSPHATES IN WASTEWATER BY THE PERIPHYTON COMMUNITIES OF ROTATING DISCS,
D. F. Jackson, and B. B. Jackson.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, Part 2, p 881-890, 1972. 1 fig, 14 tab, 10 ref.

Descriptors: *Technology, *Waste water treatment, *Phosphates, *Nutrients, *Periphyton, Domestic wastes, Sewage treatment, Biological treatment, *New York, Plankton, Trickling filters.
Identifiers: *Periphytic rotating discs, Fayetteville (N.Y.).

Competition between the plankton community and the periphyton for phosphorus in a wastewater treatment plant was evaluated. Whether periphyton pick up phosphorus at a faster rate than do plankton was determined in a series of experiments using P-32 and periphytic rotating discs, a patented design system, adapted for special treatment plants. Each of the discs was permitted to be colonized with a periphyton film before each experiment was begun. Four separate studies, one using raw sewage, one with primary effluent, one with trickling filter effluent and one with waste stabilization pond effluent are reported. Studies were made of each type of effluent using none, one, two or three rotating discs. After the discs had a film thickness of about one mm, 100 microcuries of P-32 were added to each pool. The periphyton always had a greater affinity for the P-32 and accumulated larger quantities than did the corresponding plankton biomass. It is recommended that modifications be made in design structure in wastewater treatment facilities to provide more environments for the periphyton. Through such facilities, the quantity of phosphates in the discharge waters could be greatly reduced and cultural eutrophication retarded or controlled. (Jones-Wisconsin)
W73-13725

AN INVESTIGATION OF TECHNIQUES FOR REMOVAL OF CHROMIUM FROM ELECTROPLATING WASTES,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.

Available from the National Technical Information Service as PB-215 694, $3.00 in paper copy, $1.45 in microfiche. EPA Report, Water Pollution Control Research Series, March 1971. 91 p, 22 fig, 30 tab, 9 ref. EPA Project 12010 EIE 03/71.

Descriptors: *Activated carbon, *Chromium, *Waste water treatment, Industrial wastes, Metals, Pilot plants, Flotation, *Adsorption, Solvent extractions.
Identifiers: *Electroplating wastes.

Work was conducted on the removal of hexavalent chromium from plating rinse waters employing various treatment processes. The study consisted of an initial phase in which information was sought by questionnaire and by waste water analyses on the type of waste produced by smaller electroplating plants. Laboratory studies were conducted on serveral nonconventional methods for treatment of these wastewaters including ion flotation, absorption on activated carbon, and solvent extraction. A demonstration pilot-plant study also was conducted on the activated carbon process employing actual rinse waters from a hard chrome plating operation.
W73-13745

FINAL ENVIRONMENTAL IMPACT STATEMENT, SOPE CREEK DRAINAGE AREA, COBB COUNTY, GEORGIA--AMENDMENT TO ENVIRONMENTAL IMPACT STATEMENT, COBB COUNTY SEWERAGE IMPROVEMENT PROJECT, JULY 1971.
Environmental Protection Agency, Atlanta, Ga. Region IV.

Available from NTIS, Springfield, Va., 22151 EIS-GA-73-0626-F Price $6.00 printed copy; $1.45 microfiche. April 2, 1973. 368 p.

Descriptors: *Waste water treatment, *Treatment facilities, Water pollution control, *Sewerage treatment, *Georgia, Watershed management, Streams, Sewage effluents, Sanitary engineering, Water pollution sources, Water quality, Environmental effects, Pollution abatement.
Identifiers: Cobb County (Ga), *Sope Creek watershed (Ga), *Environmental Impact Statements.

This document is an amendment to the Environmental Impact Statement, Cobb County Sewerage Improvement Project, dated July 1971 (See W72-00649). The amendment provides additional information about the proposed interceptor sewer system's environmental impact on the Sope Creek watershed in Cobb County, Georgia, and elaborates on the steps that have been taken to preserve the historical and scenic aspects of Sope Creek. Sope Creek is located in a densely populated area of northeast Georgia in the eastern section of Cobb County about five miles from Atlanta. It originates within Marietta's city limits, travels generally eastward for about 10 miles, then turns abruptly southward for about two miles before joining the Chattahoochee River. About one-half of the land area of the drainage basin is urbanized. Development is largely residential with limited amount of commercial development. Cobb County's regional wastewater collection and treatment system includes seven major interceptor sewer contracts to transport waste water out of the Sope Creek basin to a major sewer along the Chattahoochee River, and thence down the river to a new treatment plant now under construction near Highway 3 at Bolton. Because of the industrial wastes, the treated effluent being discharged to Sope Creek by Marietta's East Side Plant had a BOD of approximately 200 mg/liter (roughly equivalent to normal raw domestic sewage). (Woodard-USGS)
W73-13764

USE OF RECLAIMED WASTE WATERS AS A PUBLIC WATER SUPPLY SOURCE.
American Water Works Association, New York.
For primary bibliographic entry see Field 05G.
W73-13786

AUTOMATIC CONTROL AT THE MILTON KEYNES WORKS,
Watson (J. D. and D. M.), London (England).
H. R. Oakley.
Water Research Vol 6, p 587-589, 1972.

Descriptors: *Treatment facilities, *Waste water treatment, *Sewage treatment, *Automation, Waste disposal, Water quality control, Control systems, Project life.
Identifiers: *Milton Keynes (England).

A sewage treatment plant is being built north of London for the city of Milton Keynes. This paper describes effluent standards to be met, gives a works description and details the control objectives and methods. (Smith-Texas)
W73-13787

DIVISION OF WASTE WATER FLOW,
Technische Hochschule, Vienna (Austria). Institut fuer Wasserversorgung Abwasserreiningung und Gewasserschuts.
W. Stalzer, and W. Von Der Emde.
Water Research, Vol 6, p 371-373, 1972. 4 fig, 2 ref.

Descriptors: *Flow control, *Flow separation, *Flowmeters, *Head loss, Discharge (Water), Waste water, *Waste water treatment, Separation techniques, Treatment facilities.
Identifiers: *Waste water flow.

A brief discussion of division of waste water flow by: (1) separating channels, (2) flowmeters, (3) using weirs before the tanks, and (4) utilizing the head losses at the inlet and outlet was presented. (Smith-Texas)
W73-13788

EXTENDED AERATION IS NATURAL METHOD FOR EASY WASTE DISPOSAL,
E. Rees.
Process Engineering, p 81-82, August, 1972. 3 fig.

Descriptors: *Activated sludge, *Aeration, *Waste water treatment, Treatment facilities, Separation techniques, Water pollution control, Oxygen, Sludge, Sewage treatment, Municipal wastes, Automation, Biological treatment, Waste disposal.
Identifiers: *Bioactivator process.

Engineers have devised a very successful system within the last 15 years which combines both the concepts of the activated sludge principle as well as extended aeration. It is termed the Bioactivator process. Screened, but untreated water arrives tangentially at the periphery of a circular tank which has an outer annular aeration zone of long detention time. In this tank the water is constantly agitated in a rotary motion by a brush mechanical aeration system that transfers a predetermined volume of oxygen into the sewage. Thickened sludge at the bottom of the central settling zone is recirculated by a submersible pump to the outer annular aeration zone. All the equipment operations are fully automatic and can be carried out without supervision. (Smith-Texas)
W73-13789

EXPERIMENT USING BIOLOGICAL PONDS FOR ADDITIONAL PURIFICATION OF SEWAGE WATER (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
T. N. Sivko, T. K. Asipchik, and V. G. Kondratyuk.
Gidrobiol Zh, Vol 7, No 6, p 103-106, 1971.
Identifiers: Biological ponds, Chlorella-vulgaris, Euglenoidina, Protococcaceae, Purification, Scenedesmus-quadricauda, *Sewage treatment, USSR, *Oxidation ponds, *Waste water treatment.

The use of biological ponds in Svetlogorsk (USSR) which contained mostly Protococcaceae, Chlorella vulgaris, Scenedesmus quadricauda and Euglenoidina, for additional purification of sewage, showed that the degree of change in the biological oxygen demand was not inferior to that achieved with sand filters and was clearly preferable to the filters as far as bacterial contamination (colititer).--Copyright 1973, Biological Abstracts, Inc.
W73-13802

REACTOR COOLING WATER FOR AGRO-INDUSTRIAL DEVELOPMENT,
Oregon State Univ., Corvallis. Dept. of Soil Science.
J. L. Boersma.
Available from the National Technical Information Service as PB-223 005, $3.00 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis. Completion report, July 1973. 30 p, 15 fig, 3 tab, 7 ref. OWRR B-019-ORE (3) 14-01-0001-3323.

Descriptors: Thermal conductivity, Algae, Growth, Heated water, Soil temperature, Irrigation systems, *Oregon, Soil water, Water reuse.

Results of laboratory and field experiments are presented and analyzed. The effective thermal conductivity of soils is presented as a function of soil temerature, soil water content, and mineralogical composition. Differences between sandy soils and loam soils are indicative. Both laboratory and feild experiments show drying of the soil near the heat source to be a potential problem. It can be overcome by supplying water near the heat source with a subsurface irrigation system. Energy dissipation and temperature distribution are greatly enhanced by supplying water near the heat source with a subsurface irrigation system. During the summer a substantial fraction of the energy moves into the soil to depths below the heat source. During the winter most of the energy is discharged at the soil surface. Measurements indicated the effect on air temperature in a tall crop, such as corn, to be negligible. It is possible that on a large heated area some effect on air temperature might occur.
W73-13819

METHODS OF SWINE MANURE DISPOSAL,
Illinois Univ., Urbana.
A. J. Muehling.
In: Oregon State University, Corvallis, Agricultural Experiment Station, Special Report 316, p 10-13, December 1970.

Descriptors: *Farm wastes, *Management, *Waste disposal, *Hogs, Lagoons, Irrigation, Waste treatment.
Identifiers: Solid floors with bedding, Slotted floors.

Due to new anti-pollution laws, swine producers are compelled to plan ahead before enlarging or building new facilities for their swine. Guidelines for planning such facilities are accompanied by descriptions of the following manure handling systems: (1) solid floors with bedding - store and haul, (2) slotted floors - store and haul, (3) slotted floors - combination of lagoon and hauling, (4) slotted floors - oxidation ditch-lagoon, (5) flushing gutter-lagoon-irrigation. (Dudley-East Central)
W73-13824

CATTLE FEEDLOT POLLUTION STUDY,
Texas Tech Univ., Lubbock. Water Resources Center.
D. M. Wells, E. A. Coleman, W. Grub, R. C. Albin, and G. F. Meenaghan.
Interim Report No. 1 to Texas Water Quality Board, November, 1969. 34 p, 6 fig, 11 tab.

Descriptors: *Cattle, *Feed lots, *Farm wastes, *Waste disposal, *Waste treatment, Runoff, Precipitation, Water pollution, Irrigation, Percolation, Waste storage, Ponds, Management, Biochemical oxygen demand, Nitrogen, Aerobic treatment, Anaerobic digestion, Field crops, Germination, Texas, Cattle.
Identifiers: Flushing.

Alternative feedlot management and waste disposal systems were evaluated and agronomic studies were conducted for the economic utilization or treatment of feedlot wastes. Both dirt and concrete-surfaced feedlots were used in a conventional manner. It was tentatively concluded that conventional aerobic treatment processes are not economically feasible solutions to the problem of treatment and disposal of cattle feedlot runoff resulting from natural precipitation; that runoff from feedlots operated in a conventional manner is not suitable for direct application as irrigation on most field crops; that anaerobic treatment processes offer the best hope for treatment of feedlot runoff; and that storage of feedlot runoff in unlined ponds and treatment and disposal of feedlot runoff on agricultural lands may pose a hazard to groundwater pollution. Recommendations were that further study be given to the possibility of changing feedlot practices to provide for daily flushing and treatment by conventional means; that the agronomic studies be continued to determine safe rates of application and safe dilution factors for selected crops; and that the infiltration studies be continued and expanded to include the analyses of cores taken in the vicinity of storage ponds and the construction and operation of deeper soil columns under field conditions. (Hisle-East Central)
W73-13827

ACTIVATED SLUDGE AS A SOURCE OF PROTEIN,
Iowa State Univ., Ames. Dept. of Chemical Engineering.
A. S. Al-Zakri, and A. L. Frey
Paper No. 72-581, presented at 1972 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-15, 1972, 18 p, 3 tab, 19 ref.

Descriptors: *Activated sludge, Bacteria, *Proteins, Amino acids, Nitrogen, Iowa, *Sewage treatment, Freezethaw tests, *Extraction, E. coli, Recycling, *Waste treatment.
Identifiers: Bacillus megaterium, Biuret reaction.

Activated sludge from a municipal sewage treatment plant was extremely high in protein content. A clear solution obtained from settled activated sludge was frozen and then dried in an oven to yield a solid containing by weight 16.25% nitrogen. A purified protein form was derived through a complicated extracting process. This protein compared favorably with whole cow's milk in animo acid contents. Extraction methods involved are expensive, but another technique, treatment for bacterial breakdown as required with recycling to animals, is promising. (Frantz-East Central)
W73-13832

AGRICULTURAL WASTES--A MANAGEMENT PROBLEM,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 05B.
W73-13838

ANIMAL WASTE MANAGEMENT IN HAWAII,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
G. L. Dugan, R. H. F. Young, and G. Takamiya.
Journal Water Pollution Control Federation, Vol 45, No 4, p 742-750, April, 1973, 1 fig., 4 tab., 22 ref.

Descriptors: *Farm wastes, *Livestock, *Waste disposal, *Waste treatment, Air pollution, Water pollution, Goundwater pollution, Waste water treatment, Biochemical oxygen demand, Nitrogen, Ponds, Drying, Incineration, Recycling, *Hawaii.
Identifiers: Subtropical environment, Land spreading, Composting.

The unavailability of land suitable for accepting animal excrement near large animal raising facilities is a very critical problem in Hawaii. The problem is intensified by the pollution potential caused by the close proximity of land to the ocean. Various methods of managing animal waste ranging from land spreading to drying and incineration are discussed. A waste handling system that seems to be adaptable to a subtropical environment is a hydraulic recycling system incorporating photsynthetic reclamation. The process is based on hydraulic handling of animal excrement; gravity liquid-solids separation; aerobic biological treatment in which oxygenation can be accomplished either by the photosynthetic activity of algae or by mechanical aeration; anaerobic biological treatment; and harvesting algae from the aerobic phase, which provides the potential for nutrient recovery in the form of a high-protein animal feed supplement. (Dudley-East Central)
W73-13839

CONFINEMENT. IN ARIZONA.

Calf News, Vol 11, No 3, p 52-53, 68-69, March, 1973.

Descriptors: *Farm management, *Farm wastes, *Confinement pens, *Feed lots, *Cattle, Effluent, Waste disposal, Irrigation system, Fertilizers, Alfalfa, Arizona.

Arlington Cattle Company decided to expand their Arizona feedlot operations through confinement housing in order to make manure management easier. The following advantages were listed for confinement housing: (1) more economical, (2) easier to handle animals, (3) better working conditions, (4) better management of mud, dust, odor, and flies, (5) a savings in manure handling of about $13,000 yearly. The manure system for the new facility will be scrapers running lenghwise under the slotted floor barns. Gravity will take the effluent to a pumping station which will move it to cropland where it merges with the flood irrigation system. Alfalfa will be grown on this property owned or controlled by Arlington Cattle Company. (Dudley-East Central)
W73-13840

SALMON THAT NEED NEVER SEE THE SEA,
Rhode Island Univ., Kingston.
T. L. Meade.
The American Fish Farmer, Vol 4, No 5, p 9-10, April, 1973, 3 fig.

Descriptors: *Recirculated water, *Salmon, Rhode Island.
Identifiers: *Controlled environment, *Toxic wastes, Denitrification column.

A system capable of raising salmon in a controlled environment was developed. Salmon were cultured in this controlled environment from incubation of eggs through the grow-out phase. This facility is outdoors and consists of four insulated silo-like tanks, 5 feet in diameter and 12 feet high. These tanks provide two separate culture units, each consisting of two tanks and associated biological filters, pumps, refrigeration, heating, and oxygen units. The system is essentially closed with continuous reuse of the water until the buildup of nitrate nears an unacceptable level. The results of these studies have seen incorporated in the design of a denitrification column which, when placed in operation, should eliminate the need to discharge water from the system. (Hisle-East Central)
W73-13842

THE PRICE TAG TO STOP FEEDLOT RUN--OFF,

Beef, Vol 8, No 8, p 6-7, April, 1972, 4 tab.

Descriptors: *Farm wastes, *Waste disposal, *Feed lots, Settling basins, Lagoons, Irrigation, Nutrients, Runoff, Diversion structures, Terraces (Agricultural), Missouri, *Installation costs, *Operating costs, Cattle.

A Missouri engineer calculates the cost of a system to prevent feedlot run-off at $1,000 to $3,500 plus $300 to $600 yearly operation costs. His system consists of a diversion terrace to catch run-off, a settling basin to eliminate most solid waste in run-off, and a lagoon to hold run-off water. Irrigation equipment to pump run-off to adjacent farmland is included in the cost. Pumping rates vary and liquid may be distributed by gated pipe, hand carried sprinklers, or traveling Big Gun systems. The lagoon, ranging from 110,000 cubic feet upward, requires an earthen dam. Costs on all aspects of the system have been itemized in tables according to capacity lot sized from 200 to 1,200 head. (Frantz-East Central)
W73-13843

ODOR CONTROL MAY BE A BIG CONCERN,
Wisconsin Univ., Madison.
J. C. Converse.
Hoard's Dairyman, Vol 118, No 13, p 819, July 10, 1973.

Descriptors: *Odor, *Livestock, *Farm wastes, *Dairy industry, *Confinement pens, *Waste storage, Oxidation lagoons, Gases, Toxicity, Volatility, Aeration, Ventilation, Anaerobic bacteria.

Odors from cattle, feed, and manure are becoming a major problem for dairymen employing liquid manure pits with slotted floors or solid floor operations with manure scraped to openings in the floor. In a confinement system, anaerobic-facultative bacteria act upon the waste, resulting in odorous end products. Fixed gases and volatile organic intermediate odors, when improperly ventilated, produce discomfort not only for humans, but also for livestock. These gases, which may be measured on a chromatography, are irritants, asphyxiants, and flammable. There are no inexpensive methods of completely eliminating odors, but aeration devices, proper ventilation, and wise management reduce danger and discomfort. (Frantz-East Central)
W73-13844

LIQUID WASTE SEEPS FROM ONE BASIN TO ANOTHER.
Feedlot Management, Vol 13, No 6, p 56-57, June, 1971.

Descriptors: Aquifer, Cattle, *Farm wastes, Feed lots, Fertilizers, Irrigation systems, *Settling basins, *Lagoons, *Waste treatment, *Waste disposal, *Water pollution control, Nebraska.

In the waste handling system manure solids and liquids go into a 'debris basin' where solids settle to the bottom. The liquid passes through a rock-filled retaining wall, seeps through a median strip to the 'blackwater basin,' and is pumped back up hill onto land. It is then channeled through irrigation outlets to surrounding croplands where it seeps into the ground, gives up its plant food nutrients, goes to an underground aquifer, and eventually deposits pollution-free water into the Missouri River. Total cost of the feedlot, including the $400 per acre cost of the pollution control system (built with farm labor and equipment most farmers have available) amounted to $27,000-$27 per animal. (Hisle-East Central)
W73-13845

NEW ODOR CONTROL PROJECT.
Calf News, Vol 10, No 7, p 22, July, 1972.

Descriptors: *Odor, Waste disposal, *Feed lots, *Lagoons, Oxygen, Nitrogen, Phosphorus, Potassium, Ash, Cattle, *Farm wastes, *Air pollution, *Waste treatment, *Oklahoma.

A new product to control odor and reduce manure volume from feedlots is now being produced by RAD Limited, Inc., of Yale, Oklahoma. The product works on dead organic matter only; and in treated lagoons, no odor gases are produced. On the feedlots, dry solids are decomposed to nitrogen, phosphorus, potassium, and ash. Further tests will determine the proper amounts to be used to prevent a cracking problem which is now encountered in the lagoons. (Marquard-East Central)
W73-13846

OXIDATION DITCH IS CATTLE FEED SOURCE.
Beef, Vol 8, No 2, p 24, October, 1971.

Descriptors: Oxidation lagoons, *Feeds, *Effluent, Cattle, Aerobic bacteria, Proteins, *Waste treatment, *Recycling, Iowa.

Effluent from an oxidation ditch was used as a feed source. A feed acceptance test found that animals on the effluent ration consumed significantly more feed. The United States Department of Agriculture and the Food and Drug Administration found the carcasses acceptable but warned that further tests must be run before commercial operators can use the effluent as a feed source. One limiting factor has been the protein level: regular feed rations contain under 20% protein while this effluent contains 46.8% protein. (Marquard-East Central)
W73-13847

MONFORT LOOKS AT TREATED MANURE FOR TILE AND PLASTIC.
Calf News, Vol 10, No 8, p 4, August, 1972.

Descriptors: Feed lots, Plastics, *Tiles, Insulation, *Farm wastes, *Recycling, Waste disposal, *Waste treatment, *Ohio.
Identifiers: *Pyrolysis, Building materials.

Because future laws may restrict land application of feedlot manure, one feedlot has decided to use its wastes in a pyrolysis process to manufacture tile. While this will be the first commercial field test, laboratory results show that the product is superior to conventional tile. By using different proportions of manure and ground glass most building materials or insulation can be made. (Marquard-East Central)
W73-13848

CALIFORNIA WASTE PONDS ARE PASSING THE TEST,
M. L. Elam.
Hoard's Dairyman, Vol 118, No 5, p 311, 362, March 10, 1973, 3 fig.

Descriptors: *Irrigation storage ponds, Leaching, Effluent, Nitrates, Salts, Leakage, Pump, Recycling, Dairy industry, *California, *Waste water (Irrigation), Fertilizers, *Farm wastes.

Three California researchers have supported waste ponds as safe and legal means by which dairymen may eliminate waste drainage problems. It is doubtful if the use of waste ponds harms other water supplies. They have little odor and insect production. may be minimized. In a wide variety of soils tested, seepage and transfer of nitrogen and salts into soil were not problems. Farm wastes were easily applied to adjacent cropland. The researchers recommended the use of fifty gallons of water per cow each day and the partial emptying of waste ponds every four to six months. (Frantz-East Central)
W73-13849

SEWAGE SLUDGE INCORPORATION IN EXPERIMENTAL FIELD PLOTS TO EVALUATE HAZARDS AND BENEFITS, AND DEVELOP TECHNIQUES FOR OPTIMIZING BENEFITS AND MINIMIZE HAZARDS (FINAL ENVIRONMENTAL STATEMENT).
Agricultural Research Service, Washington, D.C.

Available from National Technical Information Service, U.S. Dept. of Commerce, as EIS-MD-72-5126-F, $3.00 paper copy, $1.45 microfiche. August 16, 1972. 13 p, 1 fig.

Descriptors: *Sludge disposal, *Maryland, *Environmental effects, *Sewage treatment, Sludge treatment, Agriculture, Water pollution sources, Waste disposal, Water quality control, Wastes, Groundwater, Sewage sludge, Sewage disposal.
Identifiers: *Environmental Impact Statements.

An experimental study of the feasibility of incorporating sewage sludge in agriculture land by a trench and cover method will be conducted. The area directly affected will be 4 acres of the Agricultural Research Center in Prince Georges County, Maryland. Approximately 1,200 dry weight tons of raw-limed or digested sewage sludge will be incorporated into the soil in a series of experimental plots designed to determine application rates and incorporation methods. The major

environmental impact of this study will be felt in the guidelines which the study will develop to provide maximum benefit and minimum hazard to the environment from the many millions of tons of sewage sludge which will be incorporated into soils in the future. Some odor may accompany the incorporated process, but this will be undetectable at the nearest habitation which is more than one half-mile distant. In addition, the proposed sludge incorporation and subsequent decomposition and leaching could possibly allow nitrates and pathogens into the groundwater below the plots. (Mockler-Florida)
W73-13860

ORGANIC WASTES FOR ACID STRIP-MINE LAKE RECOVERY,
Missouri Univ., Columbia. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W73-13915

PHENOL PLANT EFFLUENT TREATMENT,
BP Chemicals Limited, London (England). (assignee).
T. Bewley, M. D. Cooke, and M. M. Wirth.
U. S. Patent No. 3,746,639, 1 p, 3 ref; Official Gazette of the United States Patent Office, Vol 912, No 3, p 1058, July 17, 1973.

Descriptors: *Patents, *Waste water treatment, *Phenols, Pollution abatement, Sodium compounds, Water pollution control, Water quality control.
Identifiers: *Biocides, Sulphur dioxide, Sodium sulphite, Sodium bisulphite, Sodium sulphide, Sodium carbonate.

A process is described for the biodegradation of phenol plant liquid wastes. The wastes are treated with sulphur dioxide or a sulphur-containing compound prior to contacting the waste with an activated sludge biodegradation unit. Treatment of the waste with sulphur dioxide necessitates the addition of further alkali to neutralize the free acid remaining after partial neutralization by sodium carbonate contained in the waste. Removal of biocides from the waste by treatment with sulphur-containing compounds such as sodium sulphite, sodium bisulphite or sodium sulphide is thus preferred because further addition of alkali is avoided. (Sinha-OEIS)
W73-13970

DEVICE FOR AERATING LIQUIDS,
South African Inventions Development Corp., Pretoria. (assignee).
P. H. Huisman, and C. A. Jelier.
U.S. Patent No 3,744,774, 3 p, 11 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 584, July 10, 1973.

Descriptors: *Patents, *Waste water treatment, *Aeration, Equipment, *Pollution abatement, Water quality control, Water pollution control.

A gas-liquid contact element consists of a rotatable disc having portruding formations on two faces transverse to its rotational axis adapted to draw air into a liquid during rotation when immersed in waste water. The protruding formations are nodules each having a convergent shape, converging in the direction of rotation. During rotation an air bubble is drawn into the liquid by the blunt base of each nodule. The nodule breaks up the air bubble into a number of smaller bubbles, whereby a larger contact area is formed between the air and the surrounding liquid and whereby absorption of the oxygen in the diffused air bubbles by the liquid is facilitated. (Sinha-OEIS)
W73-13972

BAFFLE WASTE TREATMENT TANK,
L. M. Ziegler.
U.S. Patent No 3,744,637, 5 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 550, July 10, 1973

Descriptors: *Patents, Equipment, *Aeration, Separation techniques, *Waste water treatment, Water pollution control, Pollution abatement, Water quality control, *Baffles
Identifiers: Clarification

A waste treatment tank has a baffle dividing it into an aeration and a clarification section. Air flow is introduced into the tank at the bottom of the baffle in the aeration section and at the top of the baffle in the clarification section. Aeration section air flow creates a circulatory mixture flow upward along the lower wall surface of the baffle. Air introduced into the clarification section skims sewage solids from that section and forces solids into the aeration tank section. (Sinha-OEIS)
W73-13975

PACKAGE SEWAGE TREATMENT PLANT,
H. E. Schlenz.
U.S. Patent No 3,744,634, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 550, July 10, 1973

Descriptors: *Patents, *Waste water treatment, *Aeration, *Sewage treatment, Pollution abatement, Activated sludge, *Irrigation water, *Water reuse, Equipment, Settling basins.

A settling tank is surrounded by an annular channel into which one or more motor driven, rotatable discs depend so as to aerate, agitate, and circulate sewage contained in the channel. An angularly adjustable trough is placed over the lower portion of one of the discs and is connected to an intermediate level in the settling tank. The disc and trough function as a pump to recirculate partially settled, activated sewage from the settling tank to the aeration channel. Water suitable for irrigation is removed from the surface of the liquid in the settling tank. (Sinha-OEIS)
W73-13976

OPTIMAL PROCEDURES FOR THE PROCESSING OF WASTE ACTIVATED SLUDGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
C. W. Randall, D. G. Parker, and A. Rivera-Cordero.
Available from the National Technical Information Service as PB-223 128, $3.75 in paper copy, $1.45 in microfiche. Virginia Water Resources Research Center Bulletin 61, August 1973, 86 p, 33 fig, 2 tab. OWRR A-035-VA (9).

Descriptors: *Activated sludge, *Dewatering, Anaerobic digestion, *Aerobic digestion, Compressibility, Filterability, *Waste water treatment, Chlorination, Waste treatment, Particle size, *Optimization.
Identifiers: Polymer conditioning, Aerobic storage, Anaerobic storage, Gravity dewatering, Sludge variation, Median particle size, Floc size.

An extensive study of changes that occur in waste activated sludge when it is processed by commonly used handling procedures and the effect of these changes on subsequent dewatering of the waste sludge is described. The purpose of the study was to identify the types of conditions that make activated sludge more difficult to dewater and to formulate procedures that would optimize dewatering. The principal handling procedures studied were: anaerobic storage, chlorination, aerobic digestion, polymer conditioning, and combinations of these techniques. The effects of operational parameters on the results were also studied. These include solids concentration, temperature, mixing, dissolved oxygen concentration, aeration rate, and digester flow conditions. Dewatering changes were measured by vacuum filterability, specific resistance, and compressibility. Mechanisms of dewaterability change were elucidated and found to be related to microbial viability and floc size. A procedure for measuring floc size was developed. Aerobic digestion was found to be a beneficial sludge conditioning technique, but it must be properly used or it, too, can be detrimental to dewatering.
W73-13982

BIOLOGICAL REMOVAL OF COLLOIDAL MATTER FROM WASTEWATER,
Minnesota Univ., Minneapolis.
W. J. Maier
Copy available from GPO Sup Doc as EP1 23/2 73-147, $2.35, microfiche from NTIS as PB 223 136, $1.45. Environmental Protection Agency, Technology Series Report EPA R2 73-147, June 1973. 166 p, 36 fig, 33 tab. EPA Project 17030 DGQ

Descriptors: *Wastewater treatment, *Biological treatment, *Biodegradation, *Microbial degradation, *Mass transfer, Membrane processes, Growth rates, Colloids, Enzymes
Identifiers: Biological removal, Organic colloid removal, Exoenzyme activity, *Film flow reactors

This research program was designed to provide a more basic understanding of the mechanism and rates of removal of organic materials from wastewaters by biological processes. Pure compound feed materials were used with the exception of a series of tests on sewage solids obtained from the Minneapolis-St. Paul Sewage Treatment Plant by centrifugation of primary effluent. Two model reactor systems were used to measure rates of substrate removal. The film flow reactor, characterized by a stationary biological slime layer, was used to study removal kinetics under conditions where mass transfer may be a limiting factor. A well mixed batch reactor was used to study rates of removal under conditions where biological processes are rate controlling. Rates of substrate degradation and carbon removal are reported for each of the pure compounds using acclimated innoculum. Rate data from batch reactors are expressed in terms of microbial growth rate coefficients. Rate data from the film flow reactor is reported as the quantity of substrate removed per unit of slime surface per unit of time. (EPA)
W73-13984

LAGOON PERFORMANCE AND THE STATE OF LAGOON TECHNOLOGY.
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.

Copy available from GPO Sup Doc as EP1.23/2:73-144, $2.60; microfiche from NTIS as PB-223 129, $1.45. Environmental Protection Agency Technology Series Report EPA-R2-73-144, June 1973. 214 p, 23 fig, 10 tab, 60 ref. EPA Project 17090 FDO, 14-12-892, 68-01-0014.

Descriptors: Algae, Effluents, *Waste water treatment, Storage, Tertiary treatment, *Reviews, *Oxidation lagoons, Lagoons, *Municipal wastes.
Identifiers: Lagooning, *Lagoon treatment.

The phenomenal growth of oxidation lagoons as a form of municipal waste treatment is a reflection of their relatively low cost and ease of maintenance. The widespread acceptance of lagooning was originally predicated on their ability to produce effluent quality at least equivalent to accepted secondary treatment. In the semi-arid Great Plains states where lagoons were originally successful, such efficiencies were easily achieved for most of the year. Unfortunately, differences in climate (especially sunlight and rainfall), soil type, population density and a multitude of diverse problems have worked against such success for other portions of the country. Inventory and

operative data from municipal lagoon facilities have been collected and evaluated. The adequacy of such facilities to produce effluent to meet state water quality criteria for receiving waters has been evaluated. (EPA)
W73-13985

NITRATE REMOVAL BY ION EXCHANGE,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
S. Evans.
Journal Water Pollution Control Federation, Vol 45, No 4, p 632-636, April 1973. 2 tab, 2 ref.

Descriptors: *Ion exchange, *Nitrates, *Demineralization, Water purification, *Lime, Slurries, Cations, Water quality control, Cost analysis, Costs, Municipal water, Water softening, Water chemistry, Dissolved solids, *Waste water treatment.
Identifiers: Israel.

A strong acid-weak base ion exchange system incorporating lime slurry regeneration was studied with Beersheva (Israel) tap water to which was added 70 mg/l nitrate (negative) as sodium nitrate. There was virtually no leakage of nitrate ion during the demineralization cycle and the subsequent softening cycle. A preliminary cost analysis, based on the experimental results yielded costs of 10 cents per thousand gallons, reflecting cost advantages associated with the use of lime. Along with nitrate removal, the process results in a product water that is markedly lower in total dissolved solids than the feed, can be adjusted by blending, and is free of undesirable cations. (Bahre-Arizona)
W73-14008

CLEAN WATER -- AT WHAT COST,
Organization.
A. W. J. Dyck.
American Paper Industry, Vol 54, No 5, p 10-14, May 1972. 2 illus, 3 fig, 3 tab.

Descriptors: *Treatment facilities, *Pulp and paper industry, *Pollution abatement, *Water pollution control, *Surveys, *United States, Water pollution treatment, Investment, Engineering structures, Waste water treatment.

A survey of current and planned water pollution abatement facilities at U.S. pulp and paper mills is summarized, based on questionnaires returned by 260 mills, that is, about 33% of all 767 U.S. paper mills, representing a combined output of 24,300,000 tons of paper and paperboard plus 7,000,000 tons of pulp yearly. Responses are grouped and discussed under three categories, viz., facilities installed between 1965 and 1971, those under construction in 1972, and those scheduled for startup between 1973 and 1978. In addition to giving a representative cross-section of paper industry efforts at pollution control, the findings should also indicate the potential market for pollution-abatement equipment. (Witt-IPC)
W73-14009

WASTE WATER PURIFICATION THROUGH CATALYTIC WET OXIDATION (ABWASSER-KLAERUNG DURCH KATALYTISCHE NASSOXYDATION).
Organization.

Allgemeine Papier-Rundschau, No 33, p 1199-1200, Aug. 21, 1972.

Descriptors: *Waste water treatment, Water pollution treatment, *Industrial wastes, *Catalysts, *Oxygenation, *Toxins, Pollutants, Oxidation, Granules, Oxygen, Thermocline, Temperature, Flocculation, Filtration, Sedimentation, Coagulation, Biodegradation, Europe, Foreign research.
Identifiers: *Katox process, Fluidized beds, Continuous processes, Germany.

The 'Katox' process was developed by the Krupp Co. particularly for the treatment of highly toxic industrial effluents which contain substances that resist conventional biological degradation. It involves essentially a multistage exposure of mechanically pretreated (sedimented) or chemically pretreated (coagulated) waste waters to a stream of oxygen in a constantly agitated bed of an undisclosed granular catalyst, followed by flocculation or filtration of the oxidized organic and inorganic pollutants. The process is said to be relatively insensitive to temperature fluctuations and to operate continuously without breakdown. (Brown-IPC)
W73-14010

STATUS OF WASTE PURIFICATION IN THE FINNISH PULP AND PAPER INDUSTRY (A CELULOZ-ES PAPIRIPARI SZENNYVIZTISZTITAS HELYETE FINNORSZAGBAN),
I. Tookos.
Papiripar, Vol 16, No 2, p 61-66, 1972. 4 fig, 3 tab.

Descriptors: *Treatment facilities, *Pulp wastes, *Waste water treatment, Europe, *Water consumption, Foreign research, Pollution abatement, Water pollution treatment, Pulp and paper industry, Industrial wastes, Industrial water.
Identifiers: *Finland.

Waste water treatment and pollution abatement facilities installed at five Finnish pulp, paper, and board mills are reviewed, along with pertinent industrial water use and effluent treatment studies being conducted at the Finnish Pulp and Paper Research Institute and the Swedish Water and Air Pollution Control Research Institute. Nearly two-thirds of all industrial and domestic water use in Finland is consumed by the pulp and paper industry. Only about one-third of all waste waters discharged by Finnish paper mills is being treated, largely by mechanical methods, but some progress with chemical and biological techniques is noted. (Brown-IPC)
W73-14013

RECYCLING CAUSTIC STAGE EXTRACTION WATER IN BLEACHING,
Stephen F. Austin State Coll., Nacogdoches, Tex.
L. F. Burkart.
Paper Trade Journal, Vol 156, No 36, p 33, Aug 28, 1972. 3 tab.

Descriptors: *Bleaching wastes, *Recirculated water, *Water reuse, *Color, *Waste water treatment, Pulp and paper industry, Lignins, Precipitation, Activated carbon, Effluents, Impaired water quality, Pulp wastes, *Recycling.
Identifiers: Bleach plants, Alkaline extraction, Decoloration.

Experiments are reported, in which the waste water (black water) from the alkaline extraction stage of a pulp bleach plant was recycled in order to study the effects of recycling on the quality of the bleached pulp and on the color or ease of decolorization of the resulting, more concentrated effluents. Results indicated that the pulp required no increased consumption of bleach to achieve the desired brightness, and that the lignin in the recycled alkali-extraction water is readily precipitated, leaving an amber-colored supernatant that can be further decolored with activated charcoal or bleach, if necessary. (Witt-IPC)
W73-14014

PURIFICATION OF WASTE WATERS OF THE FOREST PRODUCTS INDUSTRY, AS ILLUSTRATED BY EXAMPLES FROM SWISS MILL OPERATIONS (RENSING AV AVLOPSVANN I TREFOREDLINGSINDUSTRIEN BELYST VED EKSEMPLER FRA SVEITSISKE BEDRIFTER),
J. Negaard.
Norsk Skogindustri, Vol 26 No 6, p 144-148, 150-151, June 1972. 7 tab, 7 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Pollution abatement, Pulp and paper industry, Europe, Water pollution treatment, Biochemical oxygen demand, Effluents, Pollutants, Surveys, Byproducts, Costs, Operating costs, Operation and maintenance, Investment.
Identifiers: *Attisholz process, *Switzerland.

Of the twenty paper mills and fourteen board mills operating in Switzerland, eighteen returned a questionnaire about their effluent treatment practices. Investment and operating costs, as well as technical details of these installations are tabulated and discussed, including the characteristics of the various waste waters, the BOD removal effectiveness of different pollution abatement methods, and the recovery of byproducts. Special attention is paid to the 'Attisholz' effluent treatment process developed by Cellulose Attisholz AG. (Brown-IPC)
W73-14015

PEAT IN POLLUTION ABATEMENT,
British Columbia Research Council, Vancouver.
J. C. Mueller.
In: Symposium, Peat Moss in Canada (La Tourbe au Canada) Proceedings, April 24-25 1972. Universite de Sherbrooke, Sherbrooke, Quebec. p 274-289. 1972. 1 fig, 7 tab, 4 ref.

Descriptors: *Peat, *Filters, *Adsorption, Water pollution treatment, Industrial wastes, Pulp wastes, Bleaching wastes, Air pollution, Pollutants, Activated carbon, Costs, Economic efficiency, *Waste water treatment.
Identifiers: Substitute materials, Adsorbents.

Studies indicate that peat may become a cheap substitute for activated charcoal and other expensive filter media or adsorbents used in the removal of pollutants from kraft mill and bleach plant wastes, similar aqueous industrial effluents, and atmospheric emissions. (Brown-IPC)
W73-14023

FLOTATION OF CELLULOSE FIBERS IN ALKALINE MEDIA (OTNOSNO FLOTATSIYATA NA TSELULOZNI VLAKNA V ALKALNA SREDA),
I. S. Monev, D. G. Dimitrov, L. L. Daskarev, and T. K. Zlatkova.
Tseluloza i Khartiya, Vol 3, No 3, p 28-31, May-June, 1972. 2 fig, 6 tab, 5 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, Additives, Fibers (Plant), Pulp and paper industry, Byproducts, Hydrogen ion concentration, Treatment facilities, Polymers, Operation and maintenance, Suspended solids.
Identifiers: Straw, *Bulgaria, Savealls, White water, Kraft mills.

Conventional flotation processes for removal of residual pulp fibers from paper machine white waters operate at pH 6.5 or below, and thus were unsuitable for the alkaline white water (pH 8) at the Miziya pulp mill (Bulgaria) which manufactures straw pulp. Sveen glue, polyimines, and related conventional flotation aids showed only about 45% flotation efficiency without addition of alum, the latter causing precipitation and co-flotation of dissolved lignin. Changes in the technological operation of flotation savealls were initiated, and three new flotation aids developed in Bulgaria were evaluated. These compounds, designated A, B, and V, of undisclosed composition, are cheap byproducts of other chemical industries and were found to be effective in alkaline media when added in a ratio of 1:200 based on the suspended fiber concentration which should be held between 0.2 and 0.5 g per liter. Other operating conditions recommended for best results include 2.5-3.0 atm pressure, pH adjustment to 8.0 or higher by adding milk of lime if need be, preliminary fiber recovery in hydrocyclones, installation of an ejector-type mixer between compressor and flotation saveall,

and addition of sodium sulfate when compound V or water of high hardness is used. (Stapinski-IPC)
W73-14026

NEW FLOTATION AIDS FOR CELLULOSIC FIBERS (NOVI FLOTOREAGENTI ZA TSELULOZNI VLAKNA),
D. G. Dimitrov, I. S. Monev, L. L. Daskalov, and T. K. Zlatkova.
Tseluloza i Khartiya (Sofia), Vol 3, No 2, p 16-19, March-April 1972. 6 tab.

Descriptors: *Waste water treatment, *Flotation, *Pulp wastes, Additives, Pulp and paper industry, Europe, Foreign research, Pollution control treatment, Hydrogen ion concentration, Pressure, Fibers (Plant), Suspended solids.
Identifiers: *Savealls, *Flotation aids, Bulgaria, Xanthates, Fiber recovery.

In most Bulgarian pulp and paper mills, fiber recovery from paper machine waste waters (white water) is performed in filtration or sedimentation units. At the Miziya Pulp and Paper Mill, a recently installed double-cell Sveen-Pedersen flotation saveall could not be operated effectively for lack of adequate flotation aids. Among several new chemicals developed for this purpose by the Bulgarian Pulp and Paper Institute (Sofia), two were found to be efficient flotation aids in acidic media. They are based on carboxymethyl xanthate (KMK-Ts) and sulfonylvinyl xanthate (SVK-Ts). When applied at recommended doses (minimum 0.3 g per liter) and under optimum conditions (pH 6.5 or less, 3 atm pressure), they performed as well as, or better than, two conventional preparations, viz., Sveen glue and isobutyl xanthate. (Stapinski-IPC)
W73-14027

ACTIVE ENVIRONMENTAL PROTECTION (AKTIVER UMWELTSCHUTZ).

Neue Verpackung, Vol 25, No 3, p 322, March 1972. 3 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Europe, Activated sludge, Biological treatment, Sedimentation, Coagulation, Flocculation, Water pollution treatment, Pulp and paper industry, Waste treatment, Industrial wastes, Effluents, Aeration, Storage capacity, Chlorination, Additives, Nutrients, Lime calcium compounds, Silica, Aerated basins.
Identifiers: Aluminum sufate, Aluminum compounds, Chlorine compounds, Thickeners, Board mills (Paperboard mills), *Germany, Raw material conservation.

A German paperboard mill operates a modern, two-stage waste water treatment plant which is described and illustrated. The first stage is conducted in a chemi-mechanical clarifier (Sedimat) of 2950 cu m volume which can theoretically handle up to 1000 cu m per hour of effluent in about 3 hr average residence time. The second, biological stage utilizes a 5800 cu m activated sludge basin (Biomat) capable of treating up to 700 cu m per hour of effluent in ca. 8 hr average dwell time. The two stages are followed by an aerated thickener which serves both to store the first-stage sludge sediment and to concentrate excess activated sludge. The latter is chlorinated to kill the microorganisms, and the residual solids (fibers and fillers) are returned to the mill's stock preparation for reuse in the paperboard furnish. Peripheral auxiliary equipment provides for dosing of aluminum sulfate, lime, silica, phosphorus and nitrogen nutrients, and chlorinated lime. (Speckhard-IPC)
W73-14029

THE ATTISHOLZ EXPERIMENTAL PURIFICATION UNIT (DIE ATTISHOLZ-VERSUCHS-REINIGUNGS-ANLAGE).
Technische Universitaet, Darmstadt (West Germany). Wasser-und Abwasserforschungsstelle

Wochenblatt fuer Papierfabrikation, Vol 100, No 1, p 24, Jan 15, 1972. 1 illus

Descriptors: *Treatment facilities, Laboratory equipment, Water pollution treatment, *Waste water treatment, Waste treatment, Effluents, Aeration, Foreign research, Testing, Evaluation, Operation and maintenance, Biological treatment
Identifiers: *Clarifiers, *Chemical reactors, Reaction vessels, *Attisholz process.

An illustrated description is given of a two-stage laboratory setup for studying industrial effluents and evaluating process parameters and treatment efficiencies of the Attisholz process developed by Cellulose Attisholz AG in Switzerland. The laboratory equipment has overall dimensions of 1.45 by 1.2 by 0.3 m and comprises essentially two aeration vessels, each followed by a clarification vessel, plus associated piping, pumping, and control equipment. Both biological and biochemical or chemical purification methods can be investigated in the apparatus. Operating procedures are outlined in some detail. (Speckhard-IPC)
W73-14030

WASTE WATER PURIFICATION AT A SULFITE PULP MILL, USING CELLULOSE ATTISHOLZ AG. AS AN EXAMPLE (DIE ABWASSERS-ANIERUNG EINER SULFITZELLSTOFF--FABRIK AM BEISPIEL DER CELLULOSE ATTISHOLZ AG.),
A. Scherler.
Chimia, Vol 26, No 3, p 157-165, March, 1972. 10 fig, 3 tab, 4 ref.

Descriptors: *Pulp wastes, *Water pollution treatment, *Treatment facilities, Sulfite liquors, Pulp and paper industry, Europe, Effluents, Industrial wastes, *Waste water treatment, Biological treatment, Sedimentation, Costs, Economic justification, Investment, Biochemical oxygen demand, Bleaching wastes, Sludge disposal.
Identifiers: *Switzerland, Multistage processes.

A detailed illustrated description is given of effluent treatment facilities at the Cellulose Attisholz AG. sulfite pulp and paper mill in Switzerland. Aqueous mill discharges comprise three different components, namely, (1) cooling water, (2) fiber-carrying effluent from the stock preparation, pulp dewatering, and pulp screening rooms, and (3) organically loaded effluents from the sulfite digester, bleach plant, and spent liquor evaporator. The cooling water requires no treatment for pollution control. The fiber-bearing effluent is subjected mainly to sedimentation. The chemically loaded discharge is neutralized and then undergoes a two-stage biological purification. Laboratory studies leading to the development of the full-scale treatment facilities are outlined. The coasts of the treatment installation are high, but the investment has paid off in achieving a BOD reduction of 97.5 to 98.5%, although some problems of ultimate sludge disposal still remain to be solved. (Speckhard-IPC)
W73-14031

BACTERIAL DECONTAMINATION OF EFFLUENTS (BAKTERITSIDNOE OBEZZARAZHIVANIESTOKOV),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Razrabotki i Ekspluatatsii Nefte promyslovykh, Kuybyshev (USSR).
F. S. Lin'kov, L. G. Konovalov, B. M. Pryakhin, and V. S. Ionova.
Bumazhnaya Promyshlennost', No 8, p 10-12, Aug 1972. 3 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Foam separation, *Disinfection, Bacteria, Coliform bacteria, Electrolysis, Oxygen, Oxygenation, Water quality, Waste treatment, Water reuse, Recirculated water, Flotation, Filtration, Suspended solids, Bituminous materials, Asphalt, Pulp wastes, Pulp and paper industry, Roofing materials, Sedimentation, Aquatic microorganisms, Ultraviolet radiation, Water pollution control, Water quality control.
Identifiers: USSR, Hypochlorites, Sodium hypochlorite.

The Kuibyshev Ruberoid Factory in the USSR, which manufactures asphalt-impregnated roofing felts, developed and installed relatively simple, low-cost equipment for effluent purification. A rotary filter separates and recovers suspended fibers. A conical sedimentor permits heavier-than-water particles to settle. Gas bubbles of nascent oxygen evolved in two continuously operating electrolytic flotators adhere to effluent particles, floating them to the surface. The resulting foam is skimmed off by drag conveyors and collected in receiving vessels. If sodium chloride is present in the effluent, bactericidal sodium hypochlorite is also formed electrolytically, resulting in substantial reductions of coliform bacterial counts and a decontaminating effectiveness of 50-60%. Subsequent passage of the purified effluent through chambers irradiated with ultraviolet light from mercury lamps achieves 95% decontamination, which meets Soviet quality standards for discharges into natural receiving waters as well as the factory's requirements for recirculation to reduce freshwater consumption. At electrode current densities of 10-18 milliamp per sq cm, a voltage of 6-12 v, and a flow rate of 8-10 cu m per hr, 96-98% of petroleum (bituminous) contaminants and 85-96% of mechanical impurities are removed from the effluents. (Stapinski-IPC)
W73-14033

USE OF ELECTRODIALYSIS FOR PROCESSING SPENT SULFITE LIQUORS (ISPOL'ZOVANIYE ELEKTRODIALIZA DLYA PERERABOTKI SUL'FITNYKH SHCHELOKOV),
Tsentralnyi Nauchno-Issledovatelskii Institut Bumagi, Moscow (USSR).
K. A. Veinov, and L. A. Mazitov.
Bumazhnaya Promyshlennost', No 5, p 7-9, May, 1972. 3 fig, 2 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Sulfite liquors, *Electrodialysis, Ion exchange, Kinetics, Energy, Electric power demand, Magnesium compounds, Efficiencies, Performance, Membrane processes, Lignins, Suspended solids, Temperature, Flow rates, Electric currents, Byproducts, Economic justification, Pulp and paper industry, Industrial wastes.
Identifiers: Lignosulfonic acids, Spent sulfite liquor, Chemical recovery.

Magnesium-base spent sulfite pulping liquors evaporated to different solids contents were electrodialyzed in an apparatus comprising two graphite electrodes plus cation-exchange, anion-exchange, and neutral membranes which divided the interelectrode space into five compartments. The liquor was introduced into the central compartment between a cation-exchange and a neutral membrane while the cathode- and anode-adjoining compartments were filled with sodium bisulfite and sulfuric acid, respectively. The process separated magnesium bisulfite, high-molecular and low-molecular lignosulfonic acids, and other organic acids. Operating variables studied included reaction rates, energy consumption, current density, magnesium oxide and total solids contents of the spent liquor, liquor flow rate, temperature, and chemical recovery efficiency. The energy consumption was found to depend on the current density, the temperature and concentration of the spent liquor, and the degree of magnesi-

ım oxide recovery. Power consumption could be reduced while improving the efficiency of the electrodialysis by conducting the process in several steps using different current densities. Since a part of the energy was consumed for recovery of mineral-free organic liquor components, a commercial market for these components would improve the economy of electrodialysis, render it more competitive with other effluent treatment methods, and justify the application of higher current densities. (Stapinski-IPC)
W73-14034

PURIFICATION EQUIPMENT AT THE IZMAIL MILL: OPERATING EXPERIENCE (OCHISTNYE SOORUZHENIYA NA IZMAIL'SKOM KOMBINATE: OPYT EKSPLUATATSII),
S. A. Perlov, and A. B. Isadskii.
Bumazhnaya Promyshlennost, No 4, p 10-12, April 1972. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Pulp wastes, *Sewage treatment, Foreign countries, Pulp and paper industry, Aeration, Biological treatment, Water pollution treatment, Rivers, Europe, Stream pollution, Waste disposal, Settling basins, Activated sludge, Sludge disposal, Ultimate disposal, Chlorination, Treatment facilities, Biochemical oxygen demand, Suspended solids, Sewage sludge, Fertilizers, Byproducts, Fermentation, Recycling, Effluents, Methane.
Identifiers: *Danube, Board mills, USSR.

Municipal sewage from the town of Izmail, Ukrainian SSR, near the Danubian Delta is treated jointly with effluents from the local bleached kraft pulp and board mill. In 1965, the mill installed equipment for mechanical and biological treatment of 42,000 liter per day of aqueous wastes containing 400 mg per liter of suspended solids and having a 5-day BOD of 200 mg per liter. Primary sedimentation in tanks removes about 60% of the solids and 30% of the BOD in 2.5 hr. Clarified effluent passes to an aeration tank of 8000 liter capacity where it is mixed with pre-aerated and sedimented sewage, while the sedimented sludge (containing mostly fine fibers) is recycled and reused along with waste paper in the manufacture of corrugated boxboard. Effluent from the activated sludge stage, which operates at 30% regeneration efficiency, contains 30 mg per liter of suspended solids and 10 mg per liter of five-day BOD. It is chlorinated before being discharged into the Danube. Sewage sludge from the primary sedimentation tanks is mixed with excess activated sludge and subjected jointly to methane fermentation, the product being used as fertilizer. (Stapinski-IPC)
W73-14035

WASTE WATER FROM FIBREBOARD MILLS,
G. Gran.
Pure and Applied Chemistry, Vol 29, p 299-321, 1972. 14 fig, 14 ref.

Descriptors: *Pulp wastes, Pollutants, *Recirculated water, *Water reuse, Effluents, Water pollution treatment, Industrial wastes, Pulp and paper industry, *Waste water treatment.
Identifiers: *Board mills (Paperboard mills).

Oxygen-consuming pollutants in the waste water (white water) discharged by paperboard mills include fibers and fiber fragments, bark particles, parenchymatous cells, wood-derived colloidal and soluble organic substances, and various water-soluble or insoluble chemicals added during board manufacture, such as alum, paraffin, fungicides, and synthetic resins. The effects of complete or partial closing of the water circuit on the total volume and concentration of contaminants in a board mill are discussed. Various methods for treating and disposing of highly polluted effluents are considered, notably evaporation plus combustion of evaporator residues, ponding, irrigation, aeration basins, and biological processes. (Witt-IPC)
W73-14036

MEASURES TAKEN AGAINST WATER POLLUTION IN THE KRAFT PULP AND PAPER INDUSTRY,
B. Hammar, and S. Rydholm.
Pure and Applied Chemistry, Vol 29, p 263-280, 1972. 1 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Pollution abatement, *Waste water treatment, Pulp and paper industry, Technology, Biochemical oxygen demand, Industrial wastes, Pollutants, Water pollution treatment, Recirculated water, Air pollution, Costs, Oxygen.
Identifiers: Kraft mills, High yield pulping, Chemical recovery, Pulp washing, Black liquors.

After a historical review of the growth of the kraft pulp and paper industry, the pulping and papermaking operations of kraft or sulfate-process pulp mills are outlined and evaluated with regard to their water-polluting aspects. Among recent technological developments holding considerable promise of abating pollution are the trend toward higher-yield pulping processes, especially semichemical processes; improved pulpwood digesters combined with countercurrent pulp washers for increased recovery of black liquor; bleaching with oxygen, resulting in low-BOD bleach plant effluents, and water recirculation for fiber recovery and attendant reduction of suspended solids. Chemical recovery from black liquor via evaporation, combustion, and causticizing of the dissolved smelt is also dealt with, as is the control of air emissions from recovery furnace stacks. Methods for BOD removal from kraft mill effluents are still expensive and generally incomplete. (Witt-IPC)
W73-14037

ADAPTATION OF THE TTC TEST TO THE STUDY OF DEHYDROGENASE ACTIVITY OF ACTIVATED SLUDGE USED FOR THE PURIFICATION OF PULP MILL EFFLUENTS (PRZYSTOSOWANIE TESTU TTC DO BADANIA AKTYWNOSCI DEHYDROGENAZ OSADOW CZYNNYCH OCZYSZCZAJACYCH SCIEK I POCELULOZOWE),
K. Lelonkiewicz.
Prezeglad Papierniczy, Vol 28, No 7, p 215-219, July, 1972. 5 fig, 3 tab, 21 ref.

Descriptors: *Activated sludge, *Bioassay, *Colorimetry, *Monitoring, *Pulp wastes, Testing procedures, *Waste water treatment, Water pollution treatment, Enzymes, Incubation, Spectrophotometry, Solvents, Chemical reactions, Effluents, Biochemical oxygen demand, Organic loading, Waste treatment, Color reactions, Color, Analyitical techniques, Sludge digestion, Biological treatment, Foreign research, Europe.
Identifiers: Triphenyltetrazole (Triphenyltetrazolium chloride), Dehydrogenases, Poland.

Samples of activated sludge containing 1-4 g per liter of organic matter and capable of reducing effluent BOD values by 90-95% were subjected to the 2,3,5-triphenyltetrazole (TTC) test for dehydrogenase activity according to procedures recommended by Lenhard and Ford. (See also W73-12535). Even with prolonged incubation and concentrated samples, the formation of red triphenylformazan was inhibited by unknown factors at pH 8.4 and 37C. After studying the influence of TTC concentration, incubation time, spectrophotometer reading time, sludge concentration, type of solvent, and potential inhibitors, the following modifications of the TTC test are proposed: Removal of supernatant liquid above the sludge sample; use of 0.1% TTC plus 0.2% glucose for a 30 min sludge incubation time; extraction of formazan with technical-grade ethanol containing 3% benzene; and spectrophotometer readings to be taken not later than 1 hr after completion of the reaction. Following these recommended conditions should produce a formazan color of greater intensity and stability. (Stapinski-IPC)
W73-14038

PURIFICATION OF EFFLUENTS FROM THE MANUFACTURE OF CONSTRUCTIONAL FIBERBOARDS (BADANIA NAD UNIESZKODLIWIANIEM SCIEKOW Z PRODUKCJI PLYT PILSNIOWYCH),
J. Pajak.
Przeglad Papierniczy, Vol 28, No 6, p 195-197, June, 1972.

Descriptors: *Activated sludge, *Pulp wastes, *Waste water treatment, *Sewage treatment, *Sludge treatment, Sludge disposal, Effluents, Industrial wastes, Waste treatment, Europe, Foreign research, Coagulation, Sedimentation, Biological treatment, Fermentation, Aerobic treatment, Anaerobic digestion, Air pollution, Sewage districts, Lignins, Cellulose, Filtration, Aerated lagoons.
Identifiers: *Hemicellulose, Poland, Przemysl.

In 1971, the sewage district of Przemysl, Poland, began construction of a central installation for joint treatment of municipal and industrial wastes by the activated sludge process. Discharges from a factory manufacturing hardboards and related building boards posed a problem, in that the spent activated sludge tends to form a fine particulate suspension which is slow to sediment, difficult to filter, and hard to dewater. The consequent provision of a long-term sludge storage lagoon ca. 7 km from the city of Przemysl encountered criticism as giving rise to air-polluting putrefaction gases and to groundwater pollution by seepage. A two-year study of alternative sludge disposal methods, initiated by the Polish Fiberboard Industry Association, recommended the coagulative removal of cellulose, hemicellulose, and lignin from the board mill effluent prior to biological treatment. Since these contaminants are chiefly responsible for the difficult handling properties of spent activated sludge, their removal should enable the sludge to be subjected to conventional anaerobic fermentation, with fuel gas as a byproduct. An alternative treatment involving intense aeration and subsequent anaerobic fermentation was also deemed feasible, but less economical. (Stapinski-IPC)
W73-14039

ACTIVATED SLUDGE AND TRICKLING FILTER TREATMENT OF EFFLUENTS AT HALLSTA PAPER MILL,
T. Sundberg, and P-A. Wikstrom.
Svensk Papperstidning, Vol 75, No 11, p 433-438, June 15, 1972. 8 fig, 4 tab, 13 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Sulfite liquors, Biological treatment, Filtration, Filters, *Trickling filters, Biochemical oxygen demand, *Activated sludge, Operation and maintenance, Industrial wastes, Aeration, Pollution abatement, Organic loading, Mixing, Effluents, Efficiencies, Foreign countries, Europe.
Identifiers: Aerators, *Sweden, Newsprint mills, Sulfite mills, Malfunction, Chemical recovery.

At the Hallsta pulp and paper mill of Holmens Bruk AB., Sweden, the production of newsprint increased from 100,000 to 400,000 tons per year between 1959 and 1969, while the organic load of total discharged waste waters increased only from 4000 to 7000 tons of five-day BOD. With more efficient recovery of the spent sulfite liquor in 1970/1971, it became possible to decrease the BOD further below 5000 tons per year. The activated sludge treatment of newsprint mill waste waters reduced the seven-day BOD by 80 to 90% using a

loading of 3-4 kg per cu m of aerator volume per day, without disturbing the biological process. Trickling filters handling a load of 2 kg per cu m of filter volume reduced the seven-day BOD by 70 to 80%. The BOD reduction of sulfite mill wastes ranged from 40 to 70% in the activated sludge unit when loaded with less than 1.5 kg of seven-day BOD per cu m of aerator volume per day. Sludge bulking, that is, sludge with poor settling characteristics, was encountered several times. The trickling filter was easier to operate and caused only minor disturbances. At loads of 1.5 to 3.0 kg per cu m per day, in terms of seven-day BOD, it gave BOD reductions of 50 to 60%. Mixing of the sulfite pulp plus paper mill effluents gave slightly better results in the activated sludge unit and made no noticeable difference to the trickling filter. (Brown-IPC)
W73-14040

TREATMENT OF WASTE WATER FROM THE COTTON PROCESSING INDUSTRY (CISTENI ADPADNICH VOD Z BAVLNARSKYCH KOMBINATU),
H. Kavarikova.
Textil, Vol 27, No 6, p 209-211, 1972. 4 ref.

Descriptors: *Waste water treatment, Water pollution treatment, *Textiles, *Cotton, *Biological treatment, Biochemical oxygen demand, Color, Toxins, Pollutants, Industrial wastes, Water pollution sources, Municipal wastes, Economic feasibility, Coagulation, Iron compounds, Calcium compounds, Aluminum, Sludge treatment, Sludge disposal, Discharge (Water).
Identifiers: Aluminum compounds, *Chemical treatment.

A large cotton-processing textile factory discharges about 3000 to 6000 cu m of heavily polluted effluent waters daily. Chemical and biological methods suited for treatment of textile industry wastes are outlined and discussed with regard to their relative merits. Chemical methods which achieve about 40% reductions in effluent BOD include coagulation with iron, aluminum, or calcium salts or with calcium oxide. Biological methods achieve better BOD removals, but usually do not destroy color bodies, and pose problems in the removal of toxic components. Chemical and biological sludge dewatering methods and sludge disposal are also mentioned, along with economic considerations of treatment methods. Advantages claimed for joint municipal-industrial waste treatment are questioned. (Trubacek-IPC)
W73-14041

THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM.
Muskegon County Metropolitan Planning Commission, Mich.

Muskegon Area Industrial Expansion Commission, Muskegon, Michigan, 1972. 20 p.

Descriptors: *Water management (Applied), Water resources development, *Michigan, *Irrigated land, *Waste water treatment, Land management, Irrigation, Irrigation districts, Biological treatment, Soil amendments, Filtration, Agricultural engineering, Water treatment, Costs, Financing, Economics, Administration, Pulp and paper industry, Crop production, Sewage districts.
Identifiers: *Muskegon County (Mich).

The nearly closed system described and illustrated, approaching total water management, is unique in that it seeks, rather than shuns, effluents of high BOD loading and high solids content, as well as industrial wastes containing dyes or trace elements. The system is based on several widely used processes which are integrated for large-scale waste disposal. Essentially, waste waters from urban areas of the county, equivalent to a population of 157,000, are piped away from the shoreline to suitable locations inland where they are provided with the equivalent of conventional secondary waste treatment. After storage and disinfection, the nutrient-rich spray waters are irrigated on a variety of agricultural crops. Passage through the 'living filter' of the soil purifies the water before it is collected in an underdrainage system, monitored to assure that it meets drinking water standards, and discharged to the county's surface waters to augment low flows. Some detailed data are included regarding the composition of the waste water before and after treatment, the participants involved in the development and use of the system (a paper company, among others), the technologies utilized, and the costs and financing of the system. (Brown-IPC)
W73-14042

PH, ALKALINITY, AND CARBON DIOXIDE CONTENT OF BOILER WATER (EL PH, LA ALCALINIDAD Y EL ANHIDRIDO CARBONICO EN LAS AGUAS DE CALDERAS),
A. Gargallo Galindo.
Investigacion y Tecnica del Papel, Vol 9, No 31, p 71-84, 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, Water treatment, *Boiler feed water, Industrial water, Water types, Corrosion control, Hydrogen ion concentration, Water properties, Water quality, Carbon dioxide, Demineralization, Phosphates, Iron compounds, Calcium compounds, Silica, Scavengers, Ammonia, Carbonates, Bicarbonates.
Identifiers: Hydrazine, Corrosion inhibitors.

The treatment of boiler feed water for neutralization, decarbonation, and removal of iron, calcium, silica, and phosphate depends significantly on the pH. Corrosion and incrustations may result from improper treatment. Both internal and external methods for the reduction of carbonate- and bicarbonate-caused hardness are discussed. Experimental evidence is presented to substantiate the effectiveness of ammonia or hydrazine as carbon dioxide scavengers. (Speckhard-IPC)
W73-14043

COAGULANTS AND FLOCCULANTS FOR THE PURIFICATION OF EFFLUENTS (KOAGULYANTY I FLOKULYANTYDLYA OCHISTKI STOCHNYKH VOD),
V. M. Shapchenko.
Bumazhnaya Promyshlennost', No 5, p 18-19, May, 1972. 1 tab.

Descriptors: *Pulp wastes, *Water pollution treatment, *Waste water treatment, Flocculation, Sedimentation, Coagulation, Polymers, Lime, Calcium compounds, Aluminum, Foreign research, Hydrogen ion concentration, Suspended solids, Pulp and paper industry.
Identifiers: *Aluminum sulfate, Aluminum compounds, *White water, USSR.

Experiments on the clarification of paper machine white waters were conducted at the First Leningrad Paper Mill, with the following results: Simple sedimentation was inadequate for removal of fiber and filler residues. Flocculants, such as polyacrylamide, polyethylene oxide, polyethylenimine, and Separan were ineffective without prior addition of coagulants. Satisfactory purification, namely, a Snellen transparency index of 15 to 35 cm and a residual suspended solids content of 1.8 to 15 mg per liter, was achieved by treating the white water with 25-50 mg per liter of aluminum sulfate, with or without lime for pH adjustment, followed 1 to 3 min later by addition of flocculant. (Stapinski-IPC)
W73-14044

USE OF REVERSE OSMOSIS AND ULTRAFILTRATION FOR THE PURIFICATION OF EFFLUENTS (PRIMENENIE METODOV OBRATNOGO OSMOSA I ULʹTRAFILʹTRATSII PRI OCHISTKE STOKOV),
Khimiko-Tekhnologicheskii Institut, Moscow (USSR).
Yu. I. Dytnerskii, A. A. Svittsov, Yu. K. Romanenko, Yu. N. Zhulin, and V. P. Semenov.
Bumazhnaya Promyshlennost', No 7, p 22-24, July 1972. 2 fig, 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, *Filtration, *Membrane processes, Pollution control treatment, Pressure, Dissolved solids, Salts, Effluents, Industrial wastes, Pulp and paper industry, Foreign research, Recirculated water, Water reuse.
Identifiers: Cellulose acetate, Ultrafiltration (or Pressure filtration), USSR, Condensates, Black liquors.

Black liquor evaporator condensates, raw mill effluents, and chemically or biologically pretreated aqueous wastes of the Baikal kraft pulp mill were subjected to reverse osmosis in comparison with ultrafiltration, using Soviet-made cellulose acetate membranes. Both methods of effluent treatment recovered water of sufficient purity for recycling as pulp mill process water. Ultrafiltration was found to operate more efficiently at relatively low pressures, i.e., 3 to 10 kg per sq cm, whereas reverse osmosis was superior in removing dissolved mineral compounds. (Stapinski-IPC)
W73-14045

SMALL TOWN WASTEWATER TREATMENT,
J. Neis.
Wisconsin Conservation Bulletin, Vol 38, No 4, p 12-12, July-Aug 1973. 2 illus.

Descriptors: *Wisconsin, *Legislation, *Financing, Government finance, *Waste water treatment, *Sewage treatment, Water quality control, *Federal Water Pollution Control Act, Municipal wastes, Loans, Sewage districts, Planning, Treatment facilities, Governments, State governments, Local governments, Federal government, Biological treatment, Pollution abatement, Water pollution control.

Typical examples are cited to show the benefits that have accrued to small townships and resort areas in Wisconsin through the financial aid provided for waste collection, water quality improvement, and sewage treatment facilities by (1) the ORAP-200 state legislative bill passed in April 1969, which allocates $144,000,000 for such purposes, (2) the October 1972 Amendments to the Federal Water Pollution Control Act which authorized further contributions to municipal sewage works, and (3) the new eligibility of many smaller communities for grants and low-interest loans through the Economic Development Agency, the Farmers Home Administration, and the Upper Lakes Regional Planning Commission. These financial boosts have encouraged local citizen groups and private landowners to join in the formation of cooperative sanitary districts to plan moderized or new biological treatment installations. (Brown-IPC)
W73-14046

TAPPI ENVIRONMENTAL CONFERENCE, 1972.
Technical Association of the Pulp and Paper Industry, Atlanta, Ga.

Proceedings of Meeting, Houston, Texas, May 14-17, 1972, TAPPI, Atlanta, Georgia, 1972. 202 p.

Descriptors: *Conferences, *Pollution abatement, *Pulp and paper industry, Air pollution, Water pollution, Effluents, Treatment, Industrial wastes, Industrial water, Ecology, Solid wastes, *Waste water treatment, Treatment facilities, Recycling, United States.
Identifiers: *Chemical recovery, Control systems.

This proceedings of a conference held in Houston, Texas, May 14-17, 1972, gives the unedited and unrefereed text of nineteen technical presentations by different authors. They deal largely with water and air pollution abatement, industrial effluent treatment processes, chemical recovery systems, recycling of process waters and of solid wastes, and related environmental concerns of the pulp and paper industry. (See W73-14051 thru W73-14056) (Brown-IPC)
W73-14050

RECYCLING FINE-PAPER MILL EFFLUENT BY MEANS OF PRESSURE FILTRATION,
Weyerhaeuser Co., Miquon, Pa.
W. S. Davis, R. S. Kraiman, J. W. Parker, and C. H. Thorborg.
In: TAPPI Environmental Conference, 1972, Proceedings of Meeting, Houston, Texas, May 14-17, 1972. TAPPI, Atlanta, Ga., p 63-73, 1972. 7 fig.

Descriptors: *Recycling, *Filtration, Filters, *Water reuse, *Waste water treatment, Pulp and paper industry, Water shortage, Industrial water, Freshwater, Treatment facilities, Equipment, Pressure, Slime, Color, Enzymes, Chlorine, Colloids, Lagoons, Coagulation, Sludge, Spring waters, Water wells, *Pennsylvania.
Identifiers: *White water, *Starch, Clarifiers, Paper machines, Amylase, Biocides, Fine papers, Printing papers, Writing papers, Sizing agents.

Five paper machines of Weyerhaeuser Co. at Miquon, Pennsylvania, are supplied with high-quality spring and well water the availability of which is diminishing. Improved production technologies and operating parameters enabled the mill to reduce its freshwater consumption from 4,400,000 gal per day in 1960 to 2,900,000 gal per day in 1969. A primary clarifier and a storage lagoon for chemically coagulated effluent sludge were installed to treat the machine waste water (white water). The need for further water conservation prompted the startup of a pressure filter to treat and recycle a portion of the clarifier effluent. Although the full-scale plant operated less efficiently than the pre-investigated pilot unit, further work is expected to cut freshwater needs by about 50%. Two major problems with the operation of the pressure filter are reported, namely, the presence of residual color in the filtrate from the manufacture of colored papers, and the formation of slime deposits in pipelines and storage tanks. Both of these problems were attributed to the dispersing action and colloidal effects of starch used as a surface sizing agent. The addition of an amylolytic enzyme plus a moderate does of chlorine solved the difficulties. (See also W73-14050) (Brown-IPC)
W73-14051

NEW LIME PROCESS FOR REMOVAL OF COLOR FROM KRAFT MILL EFFLUENT AT GEORGIA-PACIFIC WOODLAND, MAINE, MILL,
Georgia-Pacific Corp., Portland, Oreg.
M. Gould.
In: TAPPI Environmental Conference, 1972. Proceedings of Meeting, Houston, Texas. May 14-17, 1972. TAPPI, Atlanta, Ga., p 141-147, 1972. 1 fig, 3 tab.

Descriptors: *Lime, *Color, *Pulp wastes, *Bleaching wastes, *Waste water treatment, Effluents, Waste treatment, Treatment, Biochemical oxygen demand, Maintenance, Treatment facilities, Pulp and paper industry, Oregon, Dewatering, Sludge, Filters, Incineration, Solids contact processes, Industrial wastes.
Identifiers: Kraft mills, *Decoloration, Lime kilns, Chemical recovery, Kraft pulping, Clarifiers, Process variables, Alkaline extraction, Bleach plants.

The patented effluent decoloring process described involves treatment of the alkaline extraction stage waste waters from a kraft pulp bleach plant with approximately 2000 ppm of lime before entering a solids contact clarifier. The reaction of lime with color components in the waste water precipitates a settleable sludge which is continuously removed from the clarifier. The lime sludge underflow is then mixed with prefiltered lime mud and dewatered on a conventioanl belt filter. The dewatered sludge is fed directly into a lime kiln where the color bodies are burnt off and the lime is recovered for recycling. A full industrial treatment plant, which was installed after pilot plant trials, is described. The installation removes about 90% of the color and 45% of the biochemical oxygen demand from the mill effluent while recovering about 80% of the lime used. Indications are given of operating experiences with this process, including various process parameters, costs, and maintenance data, based on the first year of full-scale operation. (See also W73-14050) (Brown-IPC)
W73-14053

REVERSE OSMOSIS CONCENTRATION OF SPENT LIQUOR SOLIDS IN PRESSATES FROM HIGH-DENSITY PULPS,
Institute of Paper Chemistry, Appleton, Wis. Div. of Industrial and Environmental Systems.
A. J. Wiley, K. Scharpf, I. Bansal, and D. Arps.
In: TAPPI Environmental Conference, 1972. Proceedings of Meeting, Houston, Texas, May 14-17, 1972. TAPPI, Atlanta, Ga., p 149-162, 1972. 2 fig, 6 tab, 6 ref.

Descriptors: *Reverse osmosis, *Waste water treatment, *Treatment facilities, Pulp and paper industry, *Pulp wastes, *Water reuse, Effluents, Treatment, Waste treatment, Biochemical oxygen demand, Chemical oxygen demand, Recycling, Wisconsin, Flow, Flow rates, Temperature, Hydrogen ion concentration, Membrance, Membrane processes, Colloids, Industrial water, Sulfite liquors, Water conservation, Equipment, Industrial wastes, Color.
Identifiers: NSSC pulping, Semichemical pulping, Presses, Process variables, Spent liquors, Wash waters, High-yield pulping, Polysaccharides, Continuous process, Decoloration, Solids content, Concentrating.

A reverse osmosis pilot unit at the Institute of Paper Chemistry (Appleton, Wis.) was used to concentrate dilute pulp wash waters obtained from a nearby pulp mill (Appleton Papers Inc., Combined Locks, Wis.) where a high-yield sodium sulfite semichemical pulp had been dewatered in a screw press. The dilute pressate required no elaborate pretreatment beyond nominal pH and temperature adjustments and removal of suspended solids through a 100-mesh screen. Decreasing flux rates, observed several hours after liquor collection, were attributed to the aging of feed liquor caused by hydration of polysaccharides and formation of gelatinous hydrocolloids in the first 24 hrs of operation. Reverse osmosis at elevated temperature, about 45 C, alleviated the problem of membrane fouling. Although the flux rates attained under the conditions of this field test were only 2.5 to 5.0 gal per sq ft per day, higher speeds of about 7.5 gal per sq ft per day are deemed possible for feed liquors less than one hour old to be concentrated from 0.5-1.0% to about 5-10% solids. Continuous operation of the reverse osmosis unit in conjunction with the screw press gave 90% or better recoveries of dissolved liquor solids and 78-80% reductions of five-day biochemical oxygen demand, chemical oxygen demand, and effluent color values. The clear water obtained was of sufficiently high quality to be recycled to the process stream of the pulp mill. (See also W73-14050) (Brown-IPC)
W73-14054

INDUSTRIAL LAND APPLICATION SPRAYFIELD DISPOSAL AND WILDLIFE MANAGEMENT CAN COEXIST,
Weston Paper and Mfg. Co., Terre Haute, Ind.
E. A. Guerri.
In: TAPPI Environmental Conference, 1972. Proceedings of Meeting Houston, Texas, May 14-17, 1972. TAPPI, Atlanta, Georgia, p 199-202, 1972.

Descriptors: *Irrigation, *Spraying, *Soil disposal fields, *Pulp wastes, *Waste water disposal, *Sulfite liquors, *Land management, *Indiana, Pulp and paper industry, Effluents, Ultimate disposal, Disposal, Waste disposal, Fish, Fish management, Wildlife, Wildlife management, Sodium compounds, Industrial wastes, Hardwood, Deciduous trees, Monitoring.
Identifiers: Spent liquors, Spent sulfite liquors, Semichemical pulping, NSSC pulping, Corrugating medium, Sulfite mills, Board mills.

Since 1961, the Terre Haute, Indiana, mill of Weston Paper and Manufacturing Co. has been producing corrugating medium (i.e., the fluting layer for corrugated boxboard) by pulping hardwoods according to the neutral sulfite semichemical (NSSC) process. The total sodium-base spent sulfite liquor, namely, 200,000 gal per day containing about 10% solids, has been disposed of by a spray irrigation system on noncultivated lands without any noticeable harmful effects on an adjoining fish and wildlife management area. Prerequisites for this continued practice include careful monitoring of soil parameters, observance of strict spraying schedules to avoid runoffs and ponding, and application of land rejuvenation procedures. (See also W73-14050) (Brown-IPC)
W73-14056

CAREER DEVELOPMENT GUIDE FOR WASTEWATER FACILITY PERSONNEL,
Black and Veatch, Kansas City, Mo. Facilities Operation Services Dept.
For primary bibliographic entry see Field 05G.
W73-14092

5E. Ultimate Disposal of Wastes

AQUATIC PLANTS FROM MINNESOTA PART 4 - NUTRIENT COMPOSITION,
Minnesota Univ., Minneapolis. Dept. of Animal Science.
For primary bibliographic entry see Field 02I.
W73-13716

REVIEW OF SOME DIRECT EFFECTS OF SPOIL DUMPING ON MARINE ANIMALS,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05C.
W73-13782

EFFECTS OF SPOIL DUMPING ON THE BENTHIC INVERTEBRATES OF THE SOUND,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05C.
W73-13783

FISHERIES RESOURCES IN THE DUMP SITE AREA,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05C.
W73-13784

METHODS OF SWINE MANURE DISPOSAL,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 05D.
W73-13824

A FEEDER LOOKS AT ANIMAL WASTE DISPOSAL,
Miller Feed Lot, Shepherd, Mont.
A. L. Miller.
In: Montana Agriculture - Focus on Improving the Environment, (Proceedings), College of Great Falls, December 3-4, 1970, p 44-46. (1970).

Descriptors: *Farm wastes, *Waste disposal, *Feed lots, *Fertilizers, Cattle, Nitrogen, Phosphorus, Silage, Missouri, Montana.

January 1, 1970, figures are given for the number and size of the nation's feedlots. The possibility of using animal wastes as a fertilizer is emphasized. The Miller Feed Lot analyzed its animal waste to see if it would be profitable as a fertilizer. Its value from the nitrogen phosphorus alone was about $1.00 to $3.00 per ton, so the company decided to sell the fertilizer to the farmers at not over 50 cents per ton. In order to do this quickly, a five yard capacity front-end wheel loader was used to stack the fetilizer in expanded pens and to load it on the farmers' trucks. (Hisle-East Central)
W73-13826

ANIMAL WASTE DISPOSAL,
Connecticut Agricultural Experiment Station. New Haven Dept. of Soil and Water.
For primary bibliographic entry see Field 05G.
W73-13829

DISPOSAL OF BEEF FEEDLOT WASTES ONTO CROPLAND,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
H. L. Manges, L. S. Murphy, and E. H. Goering.
Paper No. 72-961, presented at 1972 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-15, 1972, 12 p, 5 fig, 1 tab, 6 ref.

Descriptors: *Farm wastes, *Waste disposal, Cattle, *Feed lots, Runoff, *Rates of application, *Irrigation, Corn (Field), Soil properties, Nitrogen, Phosphorus, Potassium, Sodium, Salinity.
Identifiers: Greensberg silty clay loam, Plant population, Forage yields.

A series of field plots were established to determine the influence of waste loading rates on corn forage yield and on soil properties. Separate field plots of Greensberg silty clay loam soil were established for disposal of runoff and manure. Runoff was applied to the land during the irrigation season; manure was spread after corn harvest and plowed under to a depth of 12 inches. Corn was surface planted on these plots with no pre-irrigation. Herbicides were used to control weeds, and irrigation water (from a well) supplemented runoff treatments and provided adequate moisture for the manure plots. The plants were counted to evaluate effects of treatments on population; the forage was weighed when ready for ensiling; and soil samples were taken at a depth of 10 feet, with additional samples at 3 feet in the manure plots, prior to corn planting, to assess decomposition of the manure. Conclusions were that corn plant population decreases linerily with increasing accumulated feedlot waste loadings; annual application of 10 inches of feedlot runoff gave maximum corn forage yields; and land disposal of feedlot wastes can lead to saline soil conditions and high nitrate-nitrogen concentrations in the soil profile. (Hisle-East Central)
W73-13830

MOVE TO NEW LOCATION SOLVES MANY PROBLEMS FOR CUSTOM FEEDER,
For primary bibliographic entry see Field 05G.
W73-13835

CONFINEMENT. IN ARIZONA.
For primary bibliographic entry see Field 05D.
W73-13840

SALMON THAT NEED NEVER SEE THE SEA,
Rhode Island Univ., Kingston
For primary bibliographic entry see Field 05D.
W73-13842

OXIDATION DITCH IS CATTLE FEED SOURCE.
For primary bibliographic entry see Field 05D.
W73-13847

MONFORT LOOKS AT TREATED MANURE FOR TILE AND PLASTIC.
For primary bibliographic entry see Field 05D.
W73-13848

CALIFORNIA WASTE PONDS ARE PASSING THE TEST,
For primary bibliographic entry see Field 05D.
W73-13849

CONTAMINATION OF DISCHARGE WELL FROM RECHARGE WELL,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-13962

VARI-NIP PRESS SLUDGE DEWATERING AT CONTAINER CORPORATION OF AMERICA, FERNANDINA BEACH, FLORIDA,
Improved Machinery, Inc., Nashua,N.H.
H. C. Hunt, and C. E. Gustafson.
In: TAPPI Environmental Conference, 1972. Proceedings of Meeting, Houston, Texas, May 14-17, 1972. TAPPI, Atlanta, Ga., p 163-168, 1972. 4 fig.

Descriptors: *Sludge, *Dewatering, Equipment, *Treatment facilities, *Pulp wastes, Effluents, Pumps, Ventilation, Safety, Safety factors, Incineration, Pulp and paper industry, *Florida, Flow, Flow rates, Solid wastes, Solids contact processes, *Waste water treatment, Industrial wastes, Hydrogen sulfide disposal, Waste disposal.
Identifiers: Presses, Vari-Nip press, Clarifiers.

The 'Vari-Nip' twin-roll press manufactured by Improved Machinery Inc. (Nashua, N.H.), comprises essentially a pair of perforated rolls submersed to 60% in a pressurized, bottom-fed vat, one roll being stationary and the other rotating. The variable-gap press nip permits automatic compensation for fluctuations in flow rate and/or in the concentration of underflow solids discharged from the clarifier. A press of this design has been installed at a Florida pulp and paper mill of Container Corporation of America for the single-stage dewatering of sludge sediment from the primary clarifier treatment of mill effluents. The sludge is first freed of trash in a 'Solvo-Segra' pump and then dewatered in the Vari-Nip press to the 35% dryness required for ultimate incineration. Good ventilation by high-level fans is required for safe operation of the press in closed buildings, especially on warm humid days, in order to avoid buildups of evolved hydrogen sulfide gas. Cake discharge concentrations and production rates are discussed and shown graphically as functions of feed consistency, press roll speed, and pressing force or roll loading. (See also W73-14050) (Brown-IPC)
W73-14055

INDUSTRIAL LAND APPLICATION SPRAYFIELD DISPOSAL AND WILDLIFE MANAGEMENT CAN COEXIST,
Weston Paper and Mfg. Co., Terre Haute, Ind.
For primary bibliographic entry see Field 05D.
W73-14056

5F. Water Treatment and Quality Alteration

WASTE WATER TREATMENT FACILITIES, TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio
For primary bibliographic entry see Field 05D.
W73-13672

QUALITY GOALS FOR POTABLE WATER.
For primary bibliographic entry see Field 05G.
W73-13785

EXPERIMENTAL STUDY ON THE ADSORPTION OF POLIO VACCINE VIRUS TYPE 2, DURING FILTRATION THROUGH MILLIPORE-MEMBRANE FILTERS (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 05B.
W73-13994

WATER SUPPLY AND TREATMENT IN TWO REGIONS OF SAUDI ARABIA,
Wisconsin Univ., Milwaukee. Dept. of Energetics.
E. I. Shaheen.
Water and Sewage Works, Vol 120, No 4, p 84-89, May 1973. 6 fig.

Descriptors: *Water treatment, *Demineralization, *Water distribution (Applied), *Impaired water quality, *Brackish water, Water quality control, Water pollution treatment, Groundwater resources, Municipal water, Domestic water, *Desalination plants, Dissolved solids.
Identifiers: *Saudi Arabia.

The water systems in Riyadh and the eastern region of Saudi Arabia are dependent on groundwater resources with solids concentration averaging about 2500 mg/l. This is far above the acceptable 1500 mg/l standard. This salty water is unfit for drinking and many other domestic uses. To alleviate the problem, the government is developing a program to construct conventional water treatment plants, distribution nets, and a desalination plant. Riyadh's relatively sophisticated present water treatment system includes coolers, sedimentation, filtration, and chlorination, while that in the Eastern Province is direct chlorination. The quality of water there, however, is far better than that of Riyadh, in spite of the high concentration of dissolved solids. Details are given of the desalination plant being built on the Arabian Gulf, as well as the treatment and distribution of water in the Riyadh area. (Bahre-Arizona)
W73-13995

THE 'CIKLOFLOK' WATER PURIFICATION PROCESS (A CIKLOFLOK VIZTISZTITO ELJARAS),
P. Czelecz.
Papiripar, Vol 16, No 3, p 108-111, 1972. 1 fig.

Descriptors: *Waste water treatment, Water treatment, *Coagulation, *Flocculation, *Filtration, Hydrodynamics, Additives, Filters, Industrial water, Europe, Foreign research, Pulp and paper industry.
Identifiers: Hydrocyclones, Cyclone separators, *Hungary.

The water clarification process described, patented in Hungary, is based on the joint use of aluminum sulfate and polyelectrolytic coagulants-flocculants, quartz filters, and hydrocyclones. Some details of the process, particularly specifications for the sand filter, are indicated. A practical installation at the Budafok Paper Mill has given satisfactory results. (Brown-IPC)
W73-14012

5G. Water Quality Control

AERATION OF NATURAL WATERS, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-222 962, $7.75 in paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-206, July 1973. 358 p, 240 ref (edited by G. L. Knapp, U.S. Geological Survey).

Descriptors: *Aeration, *Bibliographies, *Water quality control, *Reaeration, *Dissolved oxygen, *Oxidation, Reservoirs, Streams, Air entrainment, Oxygenation.

This report, containing 240 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). Author and subject indexes are included.
W73-13651

COMBINED TREATMENT OF MUNICIPAL WASTEWATER AND ACID MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-13656

FLOW AUGMENTING EFFECTS OF ADDITIVES ON OPEN CHANNEL FLOWS,
Columbia Research Corp., Gaithersburg, Md.
C. Derick, and K. Logie.
Copy available from GPO Sup Doc as EP1.23/2:73-238, $1.00; microfiche from NTIS as PB-222 911, $1.45. Environmental Protection Agency Technology Series Report EPA-R2-73-238, June 1973. 74 p, 25 fig, 64 ref. EPA Project 11020 GQG. 68-01-0168.

Descriptors: *Polymers, *Open channels, *Flumes, *Fluid friction, *Water pollution control, *Weirs, Spillways, Combined sewers, Non-newtonian flow, Turbulent flow, Flow augmentation, Flow measurement, Flow profiles, Roughness, Slopes, Hydraulic jump, Reynolds number, Solutions.
Identifiers: Parshall flume, Leopold-lagco flume, Injected concentrations.

Two model open channel configurations (trapezoidal and rectangular) and three water soluble polymers (Polyox Coagulant, Polyox WSR-301, and Separan AP-30) were used to experimentally determine the effects of injecting dilute polymer solutions into open channel water flows. For all test cases, injection of the three polymer additives produced flow characteristic changes reflected as either a water surface level decrease at constant flow rates or a flow rate increase at constant static heads. These flow characteristic changes were dependent, in varying degrees, on channel slope, surface roughness, injection point location, polymer injection method, flow Reynolds number, and injected polymer concentration. In addition, two flumes (Parshall and Leopold-Lagco) and two model side channel spillways (90 deg V-notch weir and sharp-crested rectangular weir) were used to determine experimentally the effects of polymer additives on the flow measuring characteristics of energy dissipators. (EPA)
W73-13664

PROTECTION OF A UNIQUE ECOLOGICAL AREA THROUGH IMPROVED WATER AND FERTILITY MANAGEMENT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
P. E. Fischbach.
Partial Technical Completion Report, June 1973. 6 p. OWRR A-031-NEB (1).

Descriptors: *Water quality control, *Fertilizers, *Return flow, *Nebraska, Irrigation practices, Water pollution control, Research and development.

Water and fertility management practices to maximize the efficiency of water use and minimize the nitrate pollution hazard related to intensive agricultural development on sandy soils are being studied. To determine the optimum amount and frequency of irrigation, three irrigation frequencies and four amounts of water will be applied to corn with an automated solid set sprinkler system. To compare the effectiveness of ground application of nitrogen fertilizer versus increment application through the systems, treatments will include applying all fertilizer by one or the other method and combination of methods. Water loss and leaching of nitrates will be studied over a range of conditions which may represent the extremes of management that would be practiced under irrigated agriculture in the Sand Hills. (Knapp-USGS)
W73-13667

URBAN STORM DRAINAGE AND FLOOD CONTROL IN THE DENVER REGION--FINAL REPORT.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 04A.
W73-13677

INVESTIGATION OF SINKING METHODS FOR REMOVAL OF OIL POLLUTION FROM WATER SURFACES; REPORT 3. TESTS AND EVALUATION OF OIL SINKING MATERIALS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. J. Houston, E. C. Roshore, and V. D. Edgerton.
Available from NTIS, Springfield, Va 22151 as AD-750 853, Price $3.00 printed copy; $1.45 microfiche. Final Report (Report 3 of a Series), April 1972. 140 p, 5 plate, 17 tab, 11 ref, 7 append.

Descriptors: *Oil spills, *Oily water, *Water pollution treatment, *Submergence, Methodology, Sorption, Testing procedures, Chemicals, Physical properties, Specific gravity, Viscosity, Asbestos, Hydrates, Magnesium, Sands, Fly ash, Silica, Water quality control, Water pollution control.
Identifiers: *Oil sinking methods, Sinking materials, Chemically treated materials.

Materials were investigated that can be utilized in the cleanup of massive oil spills by sinking the oil. The program was divided into four phases: Phase I, Survey of the State-of-the-Art; Phase II, Development of Standard Test Procedures; Phase III, Tests of Sinking Materials; Phase IV, Tests Analysis and Conclusions. This report completes the program as funded and covers the results of Phases III and IV; it also recapitulates pertinent portions of Phases I and II, both of which have been previously reported. Twenty-three oil sinking materials, which had been located in Phase I, were screened and tested (Phase III) in accordance with applicable test methods developed in the Phase II study. On the basis of current information, these materials were evaluated (Phase IV) as dry-application sinking agents for oil. Factors such as cost, availability, effectiveness in sinking and retaining oil, and hazards to personnel and plant life were evaluated. Eight materials were identified as dry-application all-season sinking agents for one or more oils; nine materials were identified as dry-application provisional sinking agents for one or more oils. One material was identified as a dry-application all-season sinking agent for all of the oils tested; one material was a dry-application provisional sinking agent for all of the oils tested. (See also W71-13452 and W72-13702) (Woodard-USGS)
W73-13696

FORECASTING WATER USE FOR ELECTRIC POWER GENERATION,
City Univ. of New York. Dept. of Mathematics.
For primary bibliographic entry see Field 06D.
W73-13705

PART I--MANAGEMENT OF WATER RESOURCES QUALITY. THE NATURAL QUALITY OF WATER RESOURCES,
Thames Conservancy, London (England).
H. Fish.
Effluent and Water Treatment Journal, Vol 17, No 11, p 585-594, 1972. 5 tab, 3 ref.

Descriptors: *Water resources, *Water quality standards, *Water quality, *Management, Water pollution control, Rainwater, Surface runoff, Surface water, Groundwater, Water analysis, Chemical properties, Physical properties, Estuaries.
Identifiers: United Kingdom, Coastal waters.

The natural quality of water resources is described. Apart from atmospheric pollution effects and atmospheric chemical reactions where pollution is considerable, the natural quality of rainfall is determined by seawater and dust uptake. Most natural surface runoff will be from areas of substantially impermeable rock, igneous and metamorphic rocks, and the clays. A typical runoff from peat or woodland areas would have a pH of 3 to 6, a color between 100 and 200 hazen units, and a COD between 20 and 60 with trace elements and sodium, calcium, magnesium, sulphate, and chloride contents similar to rainfall. Most groundwaters in the United Kingdom are usually clear and colorless, with temperatures between 10 and 14C and containing no significant flora or fauna; chalk groundwaters are naturally slightly alkaline. It is from surface runoff and groundwater springs that streams and ponds, rivers and lakes are naturally formed. Water quality in tidal waters (estuaries) is more complex than in coastal waters due to freshwater discharges. Chemical analyses, biological examinations, inspections on site, and physical factors must be studied for a baseline to assess changes by man and regulations necessary to prevent further damage of water resources. (Jones-Wisconsin)
W73-13722

IMPLICATIONS OF WASTE TREATMENT PROCESSES AND ARCTIC RECEIVING WATERS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W73-13748

STORM DRAINAGE AND FLOOD CONTROL CRITERIA: OBJECTIVES, PREMISES, PRINCIPLES, STANDARDS.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 04A.
W73-13760

QUALITY GOALS FOR POTABLE WATER.

Journal of the American Water Works Association, p 62-65, October 1972, Part 2, 1 tab, 6 ref.

Descriptors: *Water quality standards, *Potable water, *Turbidity, *Organic matter, *Color, *Odor, Aluminum, *Taste, Manganese, Zinc, *Alkalinity, Hardness, Carbon compounds, Coliforms.

The AWWA Committee of Water Quality Goals was directed to set up realistic quality goals for the water industry that were to be more exacting than existing USPHS Drinking Water Standards with respect to aesthetic qualities. The goals were to be reviewed periodically and revised if warranted. Ideal water was defined to be clear, colorless, tasteless, and odorless. It should contain no pathogenic organisms and be free from objectionable biological forms. It should not contain harmful concentrations of chemicals. It should not be corrosive to, nor leave deposits on, water-conveying structures. The water should be adequately protected by processes that insure consistency in quality. Deleting items that primarily are the concern of health authorities, the Committee discussed water quality goals in terms of the following: turbidity, nonfilterable residue, macroscopic and nuisance organisms, color, odor, taste, aluminum, iron, manganese, copper, zinc, filterable residue, carbon-chloroform extract, carbon-alcohol extract, methylene-blue-active substances, hardness, alkalinity, coupon tests, coliform organisms, and gross beta activity. (Murphy-Texas)
W73-13785

USE OF RECLAIMED WASTE WATERS AS A PUBLIC WATER SUPPLY SOURCE.
American Water Works Association, New York.

Journal of the American Water Works Association, Part 2, p 66, October 1972.

Descriptors: *Water reuse, *Waste water treatment, Effluent, Reclamation, Artificial recharge, Drinking water, Research and development.

The American Water Works Association expressed its belief that the full potential of reclaimed water as a resource should be exploited as rapidly as scientific knowledge and technology will allow. However, noting the increase in planned direct reuse of reclaimed waters, the Association was of the opinion that current knowledge and technology are not sufficiently advanced to permit direct use of treated waste waters as a source of public water supply. It urged and outlined a plan for intensive research and development by the AWWA Research Foundation and the Water Hygiene Division of the Office of Water Programs in the Environmental Protection Agency to advance technological capability in waste water reclamation. (Murphy-Texas)
W73-13786

HANDBOOK FOR ANALYTICAL QUALITY CONTROL IN WATER AND WASTE WATER LABORATORIES.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-13790

RIVER ECOLOGY AND MAN. PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM.
For primary bibliographic entry see Field 06G.
W73-13791

ANIMAL WASTE DISPOSAL,
Montana State Dept. of Health, Helena. Div. of Environmental Sanitation.
C. W. Brinck.
In: Montana Agriculture - Focus on Improving the Environment, (Proceedings), College of Great Falls, December 3-4, 1970, p 41-43. (1970).

Descriptors: *Water law, *Regulation, *Permits, *Feed lots, Waste disposal, Waste treatment, Water pollution control, Cattle, *Montana.

Montana water pollution laws are traced from 1907 through the 1970 regulation attempt to require feedlot location permits by 1973. Permits are to be issued on the basis of proximity of the feedlot to its neighbors, the possibility of odors being carried toward urban areas, fly problems, prevention of drainage to streams, the pollution of underground water and the potential for good feedlot maintenance. Permits will be required for all new construction. For existing feedlots, it is proposed that a permit be required for any feedlot located closer than one mile to the boundary of an incorporated city or town within one year after passage of the regulation. (Hisle-East Central)
W73-13825

CATTLE FEEDLOT POLLUTION STUDY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 05D.
W73-13827

DO YOU HAVE TO MOVE 'EM OR CAN YOU LEAVE 'EM,
Agricultural Research Service, Lincoln, Nebr.
N. Swanson.
Nebraska Farmer, p 13, 15, February 3, 1973, 1 fig.

Descriptors: *Feed lots, Runoff, *Waste storage, *Waste disposal, *Water pollution control, *Irrigation systems, Flood protection, Dikes, Sumps, Basins, Nebraska, Cattle.
Identifiers: SCS Rural Environmental Assistance Program.

By using help from government agencies, it is possible to control runoff from feed lots which previously might have had to relocate. As an example, the Soil Conservation Service and agricultural engineers developed a dike system for a problem feedlot on the banks of a stream. The dike prevents runoff and floods and provides weather protection for the cattle. A basin collects the runoff which is then pumped into a sump and then the water is disposed of by irrigation. The solids are spread across the top and slopes of broad-basin terraces or mounded in the feedlot. (Marquard-East Central)
W73-13828

ANIMAL WASTE DISPOSAL,
Connecticut Agricultural Experiment Station. New Haven Dept. of Soil and Water.
C. R. Frink.
Compost Science, p 14-15, November-December. 7 ref.

Descriptors: *Farm wastes, *Waste disposal, Water pollution, Nitrates, Nutrients, Sewage treatment, *Fertilizers, *Farm practices.

Recent data show that manure applied to field crops does not improve yields enough to offset the cost of hauling and spreading. Alternatives are (1) stop producing manure, (2) hide it on the 'back forty,' or (3) place it in a sewage treatment plant. These are not acceptable because we need the food produced by the animals, 'hiding it' may contaminate drinking water, and sewage treatment is too expensive. With alternative methods exhausted, the data must be re-examined for application of manure to field crops. Studies indicate that improved agronomic practices will increase the efficiency of nitrogen utilization and reduce the total nitrogen imparted on the farm. It is also suggested that, when feasible, animal wastes be applied to forest lands. (Marquard-East Central)
W73-13829

SEEPAGE LOSSES AND FERTILIZER PRESERVATION IN MANURE STACKING PRACTICE,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
T. S. Hsu, C. O. Cramer, and J. C. Converse.
American Society of Agricultural Engineers, Paper No. 72-442, 1972. 23p, 8 tab, 11 fig., 15 ref.

Descriptors: *Seepage, *Farm wastes, Cattle, *Solid wastes, Organic matter, *Nutrients, Nitrogen, Physical properties, Chemical properties, Volatility, Degradation (Decomposition), Dairy, *Waste disposal, *Waste storage, Wisconsin, Biochemical oxygen demand, Chemical oxygen demand
Identifiers: *Manure stacking, Bedding, Steam distillation method

A model study of manure stacking using a 3x3 factorial design with two replicates was conducted to determine the effect of type and amount of bedding on seepage losses, manure degradation and volumes. Corn stalks and oat straw were utilized in the experiment at 3 levels: (1) the control (no bedding), (2) the addition of 1.5 lb. of bedding material per 60 lb of fresh manure, and (3) the addition of 3.0 lb. of bedding material per 60 lb of fresh manure. The following conclusions were reached: the addition of bedding material to fresh manure decreases the losses of organic matter, solids, and nutrients in the seepage from the manure stacks; corn stalks significantly reduce the losses of seepage and nitrogen, COD, BOD, and solids in the seepage while oat straw does not; a high percentage of organic matter, nutrients and solids are preserved in the stacks; and higher quantities of BOD5, COD, solids, and nutrients were lost in the seepage from the stacks with a lower level of treatment before the freezing period and immediately after the spring thaw. Experimental procedures and results are outlined. (Dudley-East Central)
W73-13831

MOVE TO NEW LOCATION SOLVES MANY PROBLEMS FOR CUSTOM FEEDER,
E. W. Manthey.
Feedlot Management, Vol 13, No 8, p 34-44, August, 1971.

Descriptors: *Relocation, *Farm wastes, *Feed lots, Arizona, Cattle.
Identifiers: Retention pond, Fly parasites, Biological fly control, Preconditioning, Feeding out and finishing.

Ecology and odor complaints from residents living near the Phoneix stockyards plus the problem of disposing economically of cattle wastes in an urban area were only two of the reasons why the Producers Livestock Marketing Association built a new feedlot of Maricopa. Another factor was plentiful nearby farmland which could absorb cattle-produced wastes in the new location at a fair return. The new feedlot was graded to include an anti-pollution pond for bacterial and anaerobic breakdown of animal wastes and for retention of the effluent on the land. A detailed description of the construction of the feedlot is given. Both the feeding out and finishing cattle process, and the preconditioning of stockers and feeders are discussed. Gnats (2 or 3 kinds that come from Africa) are used for biological fly control. (Dudley-East Central)
W73-13835

ECONOMICS OF WATER POLLUTION CONTROL,
Economic Research Service, Washington, D.C.
J. P. Biniek.
In: Frontiers in Conservation, Proceedings, 24th Annual Meeting, Soil Conservation Society of America, Colorado State University, Fort Collins, August 10-13, 1969, p 102-106 (1969) 1 tab., 10 ref.

Descriptors: *Pollution, *Water pollution, *Economics, Herbicides, *Water pollution control, Animal wastes, Waste disposal, Livestock, Feed lots, Runoff, Waste treatment, Percolation, *Management.

In broad, general terms many problems in the economic area of pollution control are discussed. Pollution is defined as 'the unfavorable alteration

of our surroundings, wholly or largely as a by-product of man's action.' Many means of ridding ourselves of pollutants often result in further pollution. The difficulty of securing a balance between production needs and the externalities of economics (the beneficial) and diseconomies (the harmful) is discussed along with the costs of pollution control, the economics of agricultural pollution and the role of economics as a whole. (Dudley-East Central)
W73-13837

ANIMAL WASTE MANAGEMENT IN HAWAII,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-13839

ODOR CONTROL MAY BE A BIG CONCERN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05D.
W73-13844

HOW MUCH MANURE PER ACRE.
E. D. Anderson.
The Farm Quarterly, Vol 27, No 5, p 44-45, Fall, 1972, 2 tab.

Descriptors: *Farm wastes, *Waste disposal, Hogs, Cattle, *Cycling nutrients, *Fertilizers, Groundwater pollution, *Legal aspects, Nitrates, Productivity, Potassium, Phosphorus, Regulation, Toxicity.

The laws of many states reflect concern over the harmful effects of manure on soil and water. Specific regulations for Kansas, Missouri, and Indiana are discussed. Concern is also reflected in university studies. One study was conducted at Michigan State University to determine a feasible rate of manure application. Manure applications at rates of 10, 20, and 30 tons per acre were made annually from 1963 to 1971 to Conover-Hodunk loam and Metea sandy loam. Soil samples were taken, corn yields were recorded, and mineral analyses of the corn were made. The optimum rate for applying manure to sandy loam was 10 tons per acre. Higher rates posed the hazard of nitrate contamination of ground water and buildup of available nitrogen and potassium. (Dudley-East Central)
W73-13850

FLY CONTROL AND CHRONIC TOXICITY FROM FEEDING DURSBAN (0,0-DIETHYL 0-3, 5, 6-TRICHLORO-2-PYRIDYL PHOSPHOROTHIOATE) TO LAYING HENS,
Hawaii Univ., Honolulu. Coll. of Tropical Agriculture.
M. Sherman, and R. B. Herrick.
Poultry Science, Vol 52, No 2, p 741-747, March, 1973, 3 tab, 3 fig, 12 ref.

Descriptors: *Pesticide toxicity, *Farm wastes, *Poultry, Larvae, Feeds, Additives.
Identifiers: Dursban, *Fly control.

The effects of administering technical Dursban at concentration of 25, 50, and 200 ppm in the feed of laying hens were studied over a 52 week period. The estimated mean daily intake of Dursban was 2.48, 5.12, and 20.44 mg. per hen for those receiving 25, 50, and 200 ppm, respectively. Dursban at 50 ppm resulted in excellent control of larvae of Musca domestica L., Fannia pusio (Wiedemann), Chrysomya megacephala (F.), and Boettcherisca peregrina (Robineau-Desvoidy) but only moderate control of Parasarcophaga argyrostoma (Robineau-Desvoidy). No hen mortality occurred that could be attributed to the insecticidal treatment. There was a direct relationship between Dursban concentration and blood plasma cholinesterase inhibition. However, overall feed consumption, body weight, egg production, feed efficiency, egg weight, interior egg quality, and shell thickness were normal. Eggs from treated hens had no detectable off-flavors or off-odors. (East Central)
W73-13851

A MODEL WATER CODE, WITH COMMENTARY,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 04A.
W73-13857

THE DIMENSIONS OF COASTAL ZONE MANAGEMENT.
For primary bibliographic entry see Field 06E.
W73-13858

THE WETLANDS STATUTES: REGULATION OR TAKING,
W. Welsh.

Descriptors: *Land use, *Zoning, *Wetlands, *Estuaries, *Legislation, Legal aspects, Environmental effects, Coastal marshes, Tidal marshes, Aquatic environment, Wildlife conservation, Water quality, Constitutional law, Flood plain zoning, Land management, Land development, Connecticut, Permits, Coasts.
Identifiers: Inverse condemnation.

Public concern has precipitated legislation in many states to regulate the activities landowners can pursue in the use of marshland areas. These statutes provide restrictions or permit requirements for endeavors such as draining, dredging, excavation, and the filling and erection of structures. The 'taking' issue raised by the Connecticut wetlands statute is discussed. Consideration is given to the statutory approach of other states to wetlands regulations, the 'taking' issue under those statutes, and the resultant judicial disposition. The importance of wetlands is discussed; it is pointed out that the extraordinary fertility of coastal wetlands is the key to the biological value of an estuary. Since population in coastal regions is increasing, the manifold forces acting on the delicate natural balance of estuaries exigently require the regulation of activities in wetland areas. (Mockler-Florida)
W73-13859

THE REFUSE ACT OF 1899: ITS SCOPE AND ROLE IN CONTROL OF WATER POLLUTION,
D. D. Eames.
Ecology Law Quarterly, Vol 1, No 1, p 173-302, Winter 1971. 200 ref.

Descriptors: *Rivers and Harbors Act, *Legislation, *Law enforcement, *Water Quality Act, Water quality control, Water quality standards, Legal aspects, Water conservation, Judicial decisions, Water pollution control, Federal Water Pollution Act, Federal government, State governments, Navigable waters, Waste disposal, Permits, Remedies, Penalties (Legal).
Identifiers: *Refuse Act, Administrative regulations, Army Corps of Engineers, National Environmental Policy Act, Fish and Wildlife Conservation Act, Citizen suits.

Due to inadequacies in federal water pollution control law, the government has been turning more and more to the Refuse Act to presecute water polluters. The scope of the act is defined through examination of its legislative, judical, and administrative history. Possible modes of action and remedies available under it are explored. Use of the Refuse Act as a complement to existing federal water quality legislation will contribute to attainment of the goal of comprehensive and effective control of water pollution. The simplicity of the Refuse Act's enforcement procedures, that is, its blanket prohibition on waste discharges, offers strength but ignores the complexities involved in pollution control. If however, the Refuse Act is integrated into the scheme provided by the Water Quality Act, the faults of both statutes are partially ameliorated. In effect, use of the Refuse Act in cases of emergency and of violation of effluent standards puts teeth into the enforcement provisions of the Water Quality Act and extends the scope of modern legislation. (Mockler-Florida)
W73-13863

LEGISLATIVE RESPONSES TO AIR AND WATER POLLUTION,
W. B. Lowman.
Ohio State Law Journal, Vol 33, p 860-897, 1972. 1 tab, 242 ref.

Descriptors: *Legislation, *Pollution abatement, *Water pollution control, *Air pollution, Air environment, Public health, Legal aspects, Water pollution sources, Water quality control, Law enforcement, Water Quality Act, Legislation, International commissions, Taxes, State governments, Treatment facilities.

Present efforts to control air and water pollution are inadequate and reflect a lack of appreciation for the seriousness of the problems and the ways to solve it. The governmental response is little more than political busywork to quiet the restless. A mobilization of research, technical, and political facilities to forestall the impending environmental crisis. The pollution problem in the beginning, the problems that exist today, and what will no doubt occur in the future unless positive action is taken are described. The various control efforts available, the costs of such programs, and why many state and federal programs already enacted have failed are also discussed. International attempts to curb water and air pollution are examined and the unsolved problems are pointed out, the most glaring of which is the lack of essential intra and intergovernment cooperation and coordination. Also, the lack of enlightened anticipatory control over future pollution sources is discussed. Tax incentives to encourage the construction of pollution control devices is also discussed from the state and federal perspective. (Mockler-Florida)
W73-13864

AN EXAMINATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Washington and Lee Univ., Lexington Va.
A. N. McThenia, and L. G. Cohen.
Washington and Lee Law Review, Vol 30, p 195-222, Summer 1973. 133 ref.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Pollution abatement, *Waste treatment, Water Quality Act, Waste assimilative capacity, Water capacity standards, Industrial wastes, Municipal wastes, Federal government, Permits, Governmental interrelations, Grants, Treatment facilities, Law enforcement, Penalties (Legal), Waste disposal.
Identifiers: *Effluent limitation, Effluent charges, Refuse Act of 1899, Non-point sources (Pollution).

The Federal Water Pollution Control Act of 1972 (FWPCA) is the most far reaching attack on water pollution ever undertaken in this country. The national water pollution control effort prior to this Act under the Water Quality Act of 1965, the Clean Water Restoration Act and the Refuse Act has proven to be a failure due to inter alia, federal-state bickering and administrative problems. The FWPCA of 1972 calls for the elimination of all pollutant discharges into navigable waters by 1985. Utilizing effluent limitations, the Act sets different standards for industrial dischargers and for municipal waste treatment plants. However, the concept of receiving stream standards retained in order to constitute a floor level of water quality. A national system of discharge permits patterned

after the 1899 Refuse Act permit program will be implemented to insure achievement of these levels of control. A brief discussion of the enforcement provisions, the provisions dealing with construction grant assistance and the federal-state relationship within the Act is included. The FWPCA of 1972 has set a policy that the nation's waters are no longer to be available for waste disposal. This goal can be achieved with diligent efforts. (Brackins-Florida)
W73-13865

OIL POLLUTION AND THE BRUSSELS CONVENTION,
J. J. Higgins.
ABA Section of Insurance, Negligence, and Compensation Law, Proceedings 1971. 6 p.

Descriptors: *Oil spills, *Damages, *Compensation, *International waters, *International law, Water pollution sources, Disasters, Water pollution, Oil wastes, Oil pollution, Water law, Legal aspects, Oil, International commissions, Oil industries, Treaties, Negligence.
Identifiers: Brussels Convention of 1969.

The destruction caused by spills of huge amounts of oil from large tankers led to the International Convention on Civil Liability for Oil Pollution Damage in Brussels in 1969. Prior to the Brussels Convention, there was little international regulation of oil pollution. A 1954 Convention in London had established zones in which the discharge of oil was prohibited and prescribed certain other regulations. Acceptance of this convention was slow, and really didn't cover problems of prosecution and civil liability. The Brussels Convention is designed to compensate persons who have suffered damages on the territory of a contracting state caused by pollution resulting from the escape or discharge of oil from vessels, as well as to provide for reimbursement of the costs of preventive measures taken by anyone to prevent oil pollution damage and clean up costs incurred by any government. A Supplementary Convention planned for 1971 will discuss compensation for pollution damage not covered by the 1969 Convention. (Glickman-Florida)
W73-13866

STATE LEGISLATION CONCERNING MARINE POLLUTION FROM VESSELS,
G. W. Paulsen.
ABA Section of Insurance, Negligence, and Compensation, Proceedings 1971. 5 p, 6 ref.

Descriptors: *Legislation, *Ships, *Water quality control, *Governmental interrelations, Oil spills, Water pollution sources, Regulation, Legal aspects, Constitutional law, Water law, Navigable waters, Water quality standards, Water quality, Political aspects, State jurisdiction.
Identifiers: *Federal Water Quality Improvement Act, Admiralty.

In spite of the passage of the Federal Water Quality Improvement Act of 1970 (FWQIA) various states are considering similar legislation, creating problems for the mari-time industry and their insurance underwriters. While the federal government should have exclusive jurisdiction to enact legislation under the admiralty clause of the Constitution, states contend that they are authorized by the police power and a clause in the FWQIA. The constitutionality of these state statutes is now being tested in the courts. The statutes vary, some dealing only with oil spills, others with sewage and other hazardous substances. Some provide for strict liability of the offender, and others limited liability. Some states prohibit vessels which do not comply with their regulations from using their ports. Many of the state provisions conflict with the federal legislation. Technology should be used to keep the waters clean; civil liability and insurance should not be misused to do so. The solution to the problem calls for an international convention. (Glickman-Florida)
W73-13867

DEEP WATER PORTS.
For primary bibliographic entry see Field 06E.
W73-13868

A BILL TO TERMINATE AND TO DIRECT THE SECRETARY OF THE INTERIOR AND THE SECRETARY OF THE NAVY TO TAKE ACTION WITH RESPECT TO CERTAIN LEASES ISSUED PURSUANT TO THE OUTER CONTINENTAL SHELF LANDS ACT.
For primary bibliographic entry see Field 06E.
W73-13869

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT IN ORDER TO REQUIRE THE APPROVAL OF ADJACENT COASTAL STATES PRIOR TO THE CONSTRUCTION OF CERTAIN OFFSHORE FACILITIES.
For primary bibliographic entry see Field 06E.
W73-13870

A BILL TO PROHIBIT DISCHARGE INTO ANY NAVIGABLE WATERS OF ANY MILITARY WITHOUT CERTIFICATION BY THE ENVIRONMENTAL PROTECTION AGENCY.
For primary bibliographic entry see Field 06E.
W73-13871

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W73-13872

PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS--PROPOSED GUIDELINES, PART II.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13873

UNITED STATES V. KENNEBEC LOG DRIVING COMPANY (LOG DRIVING ON NAVIGABLE RIVER PERMITTED UNDER THE RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 06E.
W73-13875

UNITED STATES EX REL. SCOTT V. UNITED STATES STEEL CORP. (ACTION TO RESTRAIN STEEL COMPANY FROM DISCHARGING WASTE WATER INTO LAKE MICHIGAN).
For primary bibliographic entry see Field 06E.
W73-13876

STATE V. ST. REGIS PAPER COMPANY (ADMINISTRATIVE HEARING NOT CONDITION PRECEDENT TO SUIT BY STATE FOR WATER POLLUTION DAMAGES).
For primary bibliographic entry see Field 06E.
W73-13877

U.S. V. AMERICAN CYANAMID COMPANY (CRIMINAL PROSECUTION FOR WASTE DISCHARGES IN VIOLATION OF THE REFUSE ACT).
For primary bibliographic entry see Field 06E.
W73-13878

ASKEW V. AMERICAN WATERWAYS OPERATORS, INC. (CONSTITUTIONALITY OF FLORIDA'S OIL-SPILL PREVENTION AND POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 06E.
W73-13879

UNITED STATES V. ROHM AND HAAS COMPANY (ACTION TO ENJOIN INDUSTRIAL DISCHARGE INTO HOUSTON CHANNEL UNDER THE REFUSE ACT).
For primary bibliographic entry see Field 06E.
W73-13881

UNITED STATES V. CONSOLIDATION COAL COMPANY (INJUNCTION TO STOP DEFENDANT'S DISCHARGE OF WASTES INTO NAVIGABLE WATERS UNDER THE REFUSE ACT).
For primary bibliographic entry see Field 06E.
W73-13882

DE RAHM V. DIAMOND (REVIEW OF GRANT OF CERTIFICATE FOR CONSTRUCTION OF A HYDROELECTRIC PLANT).
For primary bibliographic entry see Field 06E.
W73-13889

WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W73-13891

CITY OF MATTOON V. ILLINOIS ENVIRONMENTAL PRO. AGCY. (PETITION FOR REVIEW OF ORDER OF POLLUTION CONTROL BOARD).
For primary bibliographic entry see Field 06E.
W73-13896

CITY OF WAUKEGAN V. ENVIRONMENTAL PROTECTION AGENCY, ETC. (APPEAL FROM ORDER OF POLLUTION CONTROL BOARD ASSESSING FINES AGAINST CITY AND CORPORATION).
For primary bibliographic entry see Field 06E.
W73-13897

DE RAHM V. DIAMOND (SUIT TO REVIEW AGENCY'S ISSUANCE OF A CERTIFICATE OF 'REASONABLE ASSURANCE' THAT PROPOSED CONSTRUCTION OF FACILITIES ON A RIVER WILL NOT VIOLATE WATER QUALITY STANDARDS).
For primary bibliographic entry see Field 06E.
W73-13898

PROGRESS REPORT ON AQUATIC WEED AND ALGAE CONTROL STUDIES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
N. E. Otto, P. M. Turner, and V. S. Miyahara.
Available from the National Technical Information Service as PB-214 643, $4.50 in paper copy, $1.45 in microfiche. Report REC-ERC-72-35, October 1972. 67 p. 5 fig, 16 tab, 14 ref, 3 append.

Descriptors: *Herbicides, *Pesticide residues, Evaluation, *Algicides, *Phytotoxicity, Chlorophyta, Aquatic weed control, Algal control, Cyanophyta, Carbon, Nitrogen, Phosphorus, Pondweeds, Sago pondweed, Irrigation canals, Soils, Microorganisms, Bicarbonates, Alkalinity, Productivity, Submerged plants, Emulsifiers.
Identifiers: Rhizoclonium, Phormidium ambiguum, Carter Lake (Colo.), Elodea canadensis, Potamogeton crispus, South Platte (Colo.).

Aquatic weed control studies conducted during 1970 and 1971 included pesticide evaluation, rela-

tionship of nitrogen, phosphorus, and carbon to aquatic weed productivity, and investigation of aquatic soil microorganism populations and their possible relation to aquatic weed habitat parameters. A proprietary triethanolamine copper complex was combined with diquat and with the potassium salt of endothall to determine if aquatic herbicidal efficacy could be improved using various combinations. No significant improvement was found using the complexed copper-diquat or complexed copper-endothall mixtures over that activity produced by diquat alone or with a diquat-copper sulfate mixture. No evidence appeared indicating any advantage in using the copper complex, triethanolamine-copper complex-diquat mix over copper sulphate-diquat combinations in high bicarbonate waters. One new emulsifier formulation produced stable emulsions and was recommended for evaluation in operating irrigation canals. Laboratory studies using culture nutrient solution enriched with carbon, nitrogen and phosphorus showed that carbon limited sago pondweed growth while nitrogen and phosphorus did not. Field aquatic habitat studies determined relationships of C, N, and P to pondweed growth. Aquatic soil microorganism relationships to pondweed growth and environment were ascertained. Chemical data on canal soils, physiological types of microorganism populations are reported. (Jones-Wisconsin)
W73-13912

ORGANIC WASTES FOR ACID STRIP-MINE LAKE RECOVERY,
Missouri Univ., Columbia. Dept. of Sanitary Engineering.
C. W. Ogg.
MSc thesis, August 1972. 74 p. 13 fig, 8 tab, 20 ref. OWRR A-038-MO (1).

Descriptors: *Organic wastes, *Acid mine water, *Strip mine lakes, *Reclamation, Sulfur bacteria, Self-purification, *Missouri, Biodegradation, Laboratory tests, Hydrogen ion concentration, Iron, Sulfates, Sulfides, Anaerobic conditions, Carbon, Eutrophication, Hydrogen sulfide, Anaerobic bacteria.
Identifiers: *Sulfate reduction, Sawdust, Sugar maple leaves, Columbia (Mo.), Oak leaves, Newspapers, Wheat straw, Dried cattle manure, Dried digested sewage sludge.

Acid coal strip-mine water with low pH, high acidity, sulfate, and iron concentrations can be recovered by addition of an organic carbon source and allowing sulfate reducing bacteria (obligatory anaerobes) to cause hydrogen sulfide gas export and iron precipitation. If loading rate of organic materials is high enough that a blanket of waste organic matter is present on the bottom and other bacteria utilize the carbon source causing the system to become anaerobic, sulfate reducers become active and recovery of the acid water proceeds according to the relative biodegradability of the carbon source. Any type of biodegradable organic carbon substrate serves as a carbon source. In experiments a wide range of C:N:P ratios was used in the substrates; a table of the ratios is given. Knowledge of the ratios is useful in selecting a waste organic material for control of nutrient input. A limiting factor in field application for recovery is the amount of hydrogen sulfide gas that could be safely released to the atmosphere. The change in pH is not as good as indicator of recovery as is the change in total acidity since there is a strong buffering capacity in acid mine water. (Jones-Wisconsin)
W73-13915

WATER MANAGEMENT--BASIC ISSUES.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 06E.
W73-13916

SOME EXPERIENCES OF THE ONTARIO WATER RESOURCES COMMISSION,
Ontario Water Resources Commission, Ottawa.
For primary bibliographic entry see Field 06E.
W73-13930

THE LICENCE SYSTEM OF THE SWEDISH ENVIRONMENT PROTECTION ACT AS A MEANS TO OVERCOME DIVIDED ADMINISTRATIVE RESPONSIBILITIES,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 06E.
W73-13951

ENVIRONMENTAL PROTECTION THROUGH APPLICATION OF THE NORWEGIAN WATER LAW,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 06E.
W73-13952

REGIONAL WORKSHOP ON WATER RESOURCES, ENVIRONMENT, AND NATIONAL DEVELOPMENT.

Available from NTIS, Springfield, Va 22151 as PB-217 117 Price $3.00 printed copy; $1.45 cents microfiche. March 13-17, 1972, Singapore: 1972. 116 p.

Descriptors: *Water resources development, *Water pollution control, *Asia, *Environmental control, *Conferences, Documentation, Abstracts, Bibliographies, Reviews, Water quality, Water pollution sources, Oil spills, Eutrophication, Solid wastes, Economics, Social aspects, Ecology, Geographical regions, Foreign countries, Planning.
Identifiers: *Singapore.

This regional workshop under the joint sponsorship of the Science Council of Singapore and the National Academy of Sciences of the USA was concerned with current problems of water resources and the environment faced by countries of the Southeast Asian region, and stimulation of regional cooperation in seeking solutions. The report includes: Section A, Introduction; Section B, Working Group Summaries; and Section C, Recommendations. Included in the appendices are: plenary addresses, abstracts of technical papers, bibliography, and workshop registrants. Besides Singapore, the regional countries represented were Indonesia, Malaysia, Philippines, Thailand and Vietnam. France, Japan, Sweden, the United Kingdom, and the USA also had representatives. (Woodard-USGS)
W73-13966

TREATED WATER STORAGE FOR DESIGN CAPACITY REDUCTION,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
J. Borrelli, and T. M. Rachford.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE4, Proceedings paper No 9941, p 517-533, August 1973. 9 fig, 3 tab, 13 ref, 3 append.

Descriptors: *Water storage, *Environmental engineering, *Costs, *Simulation analysis, Water supply, Storage capacity, Water quantity, Reservoirs, Pipelines, Pumping, Methodology, Groundwater, Aquifers, Costs, Economic efficiency, Operation and maintenance, Design, Decision making.
Identifiers: *Economic analysis, *Design capacity, Sensitivity analysis, Consumption rate, Storage volume.

Treated water storage can be used to lessen peak day consumption rates in order that the design capacity of a water supply system, exclusive of the distribution system, can be reduced while providing equivalent service. A method is described for selecting an approximate least-cost combination of storage volume and design capacity. The treated water storage is to be utilized for the attenuation of high daily consumption rates so that the treatment plant and all upstream components can benefit from a reduction in design capacity and a more efficient level of operation. Treated water storage used for this purpose is called 'intermediate storage' to distinguish it from storage used for all other purposes. There appears to be a potential reduction in the total project cost even with the added costs for storage. The analysis of an example system shows that reductions do occur in the transmission line diameter with the addition of treated water storage, but not in every case. Furthermore, a reduction in the transmission line diameter is not accompanied by a large cost reduction because of other costs such as power increase. (Bell-Cornell)
W73-13967

METHOD AND APPARATUS FOR REMOVING AND RECLAIMING OIL-SLICK FROM WATER,
M. F. Olsen.
U.S. Patent No 3,745,115, 4 p, 7 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 661, July 10, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Separation techniques, *Pollution abatement, Water quality control, Water pollution control.

Floats are used to remove oil from a water surface. Each float has a collecting compartment, a ballast compartment and a flexible hose connecting each collecting compartment to a common flexible hose. The hose is connected to a separation tank on a special structure. The separation tank has two ball float control valves, one of which permits the clean water to drain back into the environment while the other permits the collected oil to be drained off for further use or refinement. (Sinha-OEIS)
W73-13971

OIL MOP AND METHOD OF USING SAME,
H. M. Rhodes.
U.S. Patent No 3,744,638, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 551, July 10, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Separation techniques, *Pollution abatement, Water quality control, Water pollution control.

The oil mop consists of an endless length of polypropylene line with multiple lengths of long narrow thin gauge strips of the same material extending radially from the line. It absorbs the oil or oil products from the surface of the water. The line passes through the surface of the water and then moves through wringers and/or water or chemical sprays or both to remove the oil from the mop. The oil is deposited in a receptacle and the cleaned mop returns to the water surface to resume its absorption of remaining oil. The endless length of mop is rooved above sheaves or pulleys which are mounted on or near a barge. The wringer rolls when driven perform two functions. They move the mop from the pulley or toward the pulley while squeezing the oil from the mop. (Sinha-OEIS)
W73-13974

WATER-SURFACE CLEANSING SHIP,
W. F. Spanner.
U.S. Patent No 3,744-257, 5 p, 4 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 455, July 10, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, Water quality control, Water pollution control, Ships, *Separation techniques.

A water-surface cleansing ship is provided for removing contaminants such as oil from the surface of water. Its hull is provided with a longitudinal channel through which the surface water will flow. The ship may be self-propelled to cause water to flow by ship movement. To remove contaminants flowing through the channel there are a grill and two conveyor belts. The grill is in the form of a wire coarse mesh screen mounted near the bow opening and extending well below the operating waterline. A seaman positioned on a walkway can remove large contaminants such as oil-soaked sea weed from the grill. One conveyor belt is positioned aft of the grill and is placed so as to project at its forward end into the water flowing in the channel. The belt passes over sprockets and rollers through a tank containing solvent or other washing medium. The second conveyor belt also projects into the water. This belt is in the form of galvanized chains connected by cross supports carrying trays or rods which in turn carry sponges to pick up contaminants. This belt also passes into a tank containing a washing medium. The ship may have a paddlewheel to draw water into the channel. Cleaned water exits from the channel through the ship's stern opening. (Sinha-OEIS)
W73-13977

PROCESS AND APPARATUS FOR CONTAINMENT OF AQUEOUS POLLUTANTS,
R. P. Fennelly.
U.S. Patent No 3,744,254, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 454, July 10, 1973.

Descriptors: *Patents, *Oil slicks, *Oil pollution, *Pollution abatement, Equipment, Water pollution control, Water quality control, *Separation techniques.
Identifiers: *Bubble barriers.

An improved version of the conventional bubble barrier is described. A gas supplying conduit is located at a point below the surface of the water to form a bubble barrier which rises to the surface of the water and is able to contain the pollutants within a preselected area. A mesh material is placed between at least one point adjacent to the generation point and a point adjacent to the surface of the water to contain the bubbles in a desired line of travel. The mesh material can be ordinary wire screening used in household screens. The upward travel of the bubbles insures that they will strike the mesh material or screening at an angle which is not substantially normal to the plane in which it lies at the point of impact. One end of the mesh screen is attached to a float. Guy wires or restraining members link the floats with the ballast member which is, in turn, attached to the gas conduit. (Sinha-OEIS)
W73-13978

OIL SPILL BOOM,
P. Y. Williams, K. C. Williams, and C. E. Heath.
U.S. Patent 3,744,253, 3 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 454, July 10, 1973.

Descriptors: *Patents, Oil spills, *Oil pollution, *Pollution abatement, *Separation techniques, Equipment, Water pollution control, Water quality control.
Identifiers: *Oil spill booms.

This boom comprises several alignable interconnectable floats, a continuous screen barrier extending through, between, above and below the floats. The part below is formed of two walls spread apart at the bottom to provide an open bottom water ballast chamber, props and stays to support the screen barrier erected. A number of floats are connected together in line and serve to contain the contaminated area. When the boom is subjected to the forces of wind and/or wave and/or current particularly athwart the structure the open bottom ballast chambers formed by the several walls and the water therein constitutes a restraining force against any tendency of the boom to heel or lift. (Sinha-OEIS)
W73-13979

IMPROVING SURFACE WATER CONDITIONS THROUGH CONTROL AND DISPOSAL OF AQUATIC VEGETATION, PHASE II,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering; and Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
R. G. Koegel, D. F. Livermore, H. D. Bruhn, and P. D. Bautz.
Available from the National Technical Information Service as PB-223 135, $3.50 in paper copy, $1.45 in microfiche. Wisconsin Water Resources Center, Madison Technical Report, 1973. 38 p, 7 fig, 16 photographs, 4 ref. OWRR B-058-WIS (1), 14-31-0001-3665.

Descriptors: *Harvesting, *Aquatic weed control, *Mulching, *Mechanical equipment, *Treatment, *Heating, Feeds, *Wisconsin.
Identifiers: Dane County (Wis), Farm equipment.

The overall objectives of Phase II of the project continue to be the same as those of Phase I, namely, the improvement of equipment and techniques for the mechanical harvesting, processing, and disposal or utilization of aquatic vegetation such that these methods can be an efficient tool in the management of nuisance plants in waterways. Primary emphasis in this Phase of the work has been on high-speed harvesting, application of the Phase I results of the project to field-scale operations by Dane County, Wisconsin, and continued work on processing and utilization of harvested material. An experimental high-speed gathering and skimmer unit was built and tested during 1972. The principle shows considerable promise as part of a two-stage harvesting system. Chopping and surface moisture dewatering on board the harvester have been incorporated into one of Dane County's units. Shuttle barges servicing this unit have been modified to incorporate self-unloading boxes of the type used for forage harvesting. The onboard processing results in decreased weight and volume, and greatly improved handling characteristics of the material and acceptability as a soil additive. Work on processing and utilization has progressed in such areas as (1) heat treatment to modify properties, (2) conversion to silage and, (3) fractionation and determination of constituents. Harvested vegetation for use as a soil conditioner was made available to the public on a trial basis. Included as an appendix is a Bibliography on Dewatering and Dewatering Processes by Vladimin I. Fomin and H. D. Bruhn, containing 293 references. (See also W72-08069)
W73-13983

CLEAN WATER -- AT WHAT COST,
Organization.
For primary bibliographic entry see Field 05D.
W73-14009

MINICOMPUTER FOR REGULATION AND CONTROL OF EFFLUENT DISCHARGES (MINIDATOR FOR STYRNING OCH KONTROLL AV AVLOPP),
B. Nilssen, K. A. Andersson, K. Eklund, and H. Hedenblad.
Svensk Papperstidning, Vol 75, No 12, p 487-489, June 30, 1972. 5 fig, 3 tab.

Descriptors: *Discharge (Water), *Pulp wastes, *Automatic control, *Control systems, *Computers, Effluents, Europe, Computer programs.
Identifiers: Minicomputers, Process control, *Sweden.

A description and schematic illustration are given of a process-control system for the automatic control of four different areas in the pulp mill of Provifors Bruk, Sweden, including monitoring of waste water discharge volumes. The system centers around a Honeywell H316 computer with a 12,000 word memory plus peripheral equipment and a DDC signal-processing software package (Kaustinen-IPC)
W73-14022

OIL SPILL EMERGENCY,
Wisconsin Dept. of Natural Resources, Madison.
D. Crehore.
Wisconsin Conservation Bulletin, Vol 38, No 4, p 16-18, July-Aug 1973. 5 illus.

Descriptors: *Oil spills, *Wisconsin, *Lakes, Pipelines, State governments, Oil pollution, Water pollution, Water pollution sources, Planning, Engineering structures, Damages, Hazards, *Pollution abatement.
Identifiers: Emergencies, *Lake Ripley (Wis).

Rapid emergency action by many experts operating under the decentralized contingency plan of the Wisconsin Dept. of Natural Resources saved Lake Ripley from contamination when a pipeline ruptured in March 1973, spilling 250,000 gal. of crude oil across the landscape. The incident is described, and the general ecological dangers of oil spills and the cleanup techniques used are discussed. (Brown-IPC)
W73-14025

THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM.
Muskegon County Metropolitan Planning Commission, Mich.
For primary bibliographic entry see Field 05D.
W73-14042

SMALL TOWN WASTEWATER TREATMENT,
For primary bibliographic entry see Field 05D.
W73-14046

TAPPI ENVIRONMENTAL CONFERENCE, 1972.
Technical Association of the Pulp and Paper Industry, Atlanta, Ga.
For primary bibliographic entry see Field 05D.
W73-14050

STIMULATED BIODEGRADATION OF OIL SLICKS USING OLEOPHILIC FERTILIZERS,
Rutgers—The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. M. Atlas, and R. Bartha.
Environmental Science and Technology, Vol 7, No 6, p 538-541, June 1973. 3 fig, 1 tab, 13 ref.

Descriptors: *Oil spills, *Biodegradation, *Nitrogen, *Phosphorus, Laboratory tests, Microbial degradation, Model studies, On-site tests, Sea water, Chemical analysis, Degradation (Decomposition), Oil pollution, On-site investigations, Oily water, Gas chromatography.
Identifiers: *Oleophilic fertilizers, *Nutrient sources, Crude oil, Fate of pollutants, CRNF, Octylphosphate, Isooctylphosphate, Hexamethylphosphoramide, Potassium nitrate, Hydrocarbon-oxidizing bacteria, Sodium hydrogen phosphate, Dodecylurea, Mineralization, Trimethylenetetraurea.

Biodegradation of polluting oil at sea is seriously limited by the scarcity of nitrogen and phosphorus. Since water-soluble sources of these elements would be ineffective in the ocean, oleophilic com-

ounds were screened to serve as fertilizers for oil licks. A combination of paraffinized urea and oc-ylphosphate promoted oil biodegradation, both in aboratory experiments and in field trials, to an ex-ent that the practical application of this principle o oil cleanup appears feasible. The tested oleo-hilic fertilizer supplies nutrients to hydrocarbon-egrading microorganisms selectively and, in con-rast to nitrate and phosphate salts, it does not rigger algal blooms. (Holoman-Battelle)
W73-14086

CAREER DEVELOPMENT GUIDE FOR WASTEWATER FACILITY PERSONNEL,
Black and Veatch, Kansas City, Mo. Facilities Operation Services Dept.
. A. Voegtle.
Water Pollution Control Federation Highlights, Deeds and Data), Vol 10, No 7, p D1, D4-D10, uly 1973. 3 fig, 2 ref.

Descriptors: *Quality control, *Personnel manage-nent, Training, Education.
Identifiers: *Certification.

Manpower planning is the basic solution to problems of personnel recruitment, retention, edu-cation and training, and certification. The Career Development Guide (CDG) was developed to bring into focus the various interrelated problems of wastewater facility management. The CDG defined jobs, training and educational require-ments, job titles, and other aspects of personnel development to provide a basis for uniform certifi-cation of personnel. (Little-Battelle)
W73-14092

INFLOW, OUTFLOW, AND WATER QUALITY OF MISSION LAKE, NORTH-CENTRAL MONTANA,
Geological Survey, Helena, Mont.
L. R. Frost, Jr.
Open-file report, 1973. 27 p, 8 fig, 2 tab, 5 ref.

Descriptors: *Irrigation water, *Water quality, *Lakes, *Montana, Water analysis, Chemical analysis, Salinity, Inflow, Discharge (Water), Water supply development, Water management (Applied), Routing, Diversion, Irrigation.
Identifiers: *Mission Lake (Mont), *Lake flush-ing, Salinity dilution.

Chemical analyses made in 1955 of samples from Mission Lake in Montana indicated the water was unsuitable for irrigation of most crops. Since that time, the lake has been flushed periodically with good quality water from Two Medicine Canal. Through this flushing process the concentration of dissolved solids in the lake water has been reduced approximately 87%. The water in Mission Lake meets criteria established by the U.S. Salinity Laboratory Staff for irrigation water applied to well-drained land. The lake water is approaching the chemical quality of the inflow; however, in-creased amounts of flushing are required to effect additional significant changes in the quality of the lake water. Continued careful flushing with most of the available flow in Two Medicine Canal could, within 2 to 3 years, make the water meet criteria established for water applied to all but the most salt-sensitive crops. (Woodard-USGS)
W73-14100

CATALOG OF RECHARGE BASINS ON LONG ISLAND, NEW YORK, IN 1969,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 04B.
W73-14103

RELATION OF CHANNEL SLOPE TO REAERATION OF MICHIGAN STREAMS,
Geological Survey, Okemos, Mich.
For primary bibliographic entry see Field 05B.
W73-14110

UNCERTAINTIES IN WATER QUALITY MODELING: THE CASE OF ATMOSPHERIC REAERATION,
Rutgers--The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
S. L. Yu.
In: Proceedings (Vol III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, Dec 11-14, 1972, p 962-976, (1972). 6 fig, 26 ref.

Descriptors: Atmosphere, *Reaeration, *Water quality, Management, Costs, *Dissolved oxygen, *Mathematical models, Estimating, Water pollution control, Decision making, Streams, Stochastic processes, Systems analysis, *Risks, *New Jersey.
Identifiers: *Passaic River basin (N.J.), Errors, Tracer method, Disturbed-equilibrium method, DO balance method.

Atmospheric reaeration is the primary means by which a water body replenishes its oxygen content. The transfer of oxygen across the air-water interface is characterized by the reaeration coefficient, designated by Ka. Knowledge of the reaeration coefficient permits determination of the self-purification capacity of a stream and thus the allowable amount of waste discharged into the stream. In designing a water quality management program, a low estimate of Ka would result in requiring a higher degree of waste treatment than necessary, while an overestimate would result in undesirable pollution of the stream. A slight error in the reaeration coefficient estimate could result in tremendous differences in the economy of a water quality management program. Herein, various sources of uncertainty in determining the reaeration coefficient are examined, and the expected errors discussed. Also the effect of errors in estimating Ka on the cost of water quality management is demonstrated by carrying out a case study on New Jersey's heavily polluted Upper Passaic River. The three basic methods for measuring Ka in the field--dissolved oxygen balance method, disturbed equilibrium method, and tracer method--are discussed. (See also W73-14166) (Bell-Cornell)
W73-14169

06. WATER RESOURCES PLANNING

FINANCING COSTS OF WATER POLLUTION CONTROL IN SWEDEN,
National Swedish Environment Protection Board, Stockholm. Water Quality Dept.
B. Hawerman, and B. Helmersson.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 445-448, 1972. 1 fig.

Descriptors: *Water management (Applied), *Water costs, *Cost sharing, *Water pollution control, *Cost allocation, Economics, Comprehensive planning, Administration, Grants, Taxes, Pollution taxes (Charges).
Identifiers: *Sweden.

The main problem in water management in Sweden is water pollution control. Sewage and waste water discharge and the establishment of new industries often interfere with the use of the coastal water for recreation purposes. This conflict between industrial and recreational interests presents one of the liveliest debated environmental issues today. Industries having significant waste discharge problems allocate on the average about 5% of their total annual capital investment for pollution control facilities and equipment. Municipalities have for the past several years devoted about 20% of total annual capital expenditure for water supply and sewerage systems construction. Annual capital expenditures for the past several years have been about 60 Swedish kroner per person. To facilitate the financing of water treatment projects, the State government pays from 30% to 50% of the construction costs of municipal sewage treatment plants and 35% of the costs for prevention of water pollution at industries established before July 1, 1969. (See also W73-13916) (Knapp-USGS)
W73-13959

6A. Techniques of Planning

CALIBRATION OF DISTRIBUTED PARAMETER GROUNDWATER FLOW MODELS VIEWED AS A MULTIPLE-OBJECTIVE DECISION PROCESS UNDER UNCERTAINTY,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
For primary bibliographic entry see Field 02F.
W73-13699

CONDITIONAL CHANCE-CONSTRAINED MODEL FOR RESERVOIR CONTROL,
London Graduate School of Business Studies (England). Dept. of Operations Research and Statistics.
For primary bibliographic entry see Field 04A.
W73-13700

INTERACTIVE MULTIOBJECTIVE PROGRAMING IN WATER RESOURCES: A CASE STUDY,
Colorado Univ., Boulder. Graduate School of Business.
D. E. Monarchi, C. C. Kisiel, and L. Duckstein.
Water Resources Research, Vol 9, No 4, p 837-850, August 1973. 1 fig, 8 tab, 10 ref.

Descriptors: *Decision making, *Alternative planning, *Algorithms, *Optimization, River basins, Water quality, Management, Water pollution control, Equations, Dissolved oxygen, Constraints, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, *Multiple objectives, Streeter-Phelps model, Interactive algorithms.

Most decision problems involve multiple objectives, yet conventional mathematical programming methods ignore the human elements peculiar to each decision problem. This paper seeks to incorporate these subjective issues into an interactive algorithm, and describes a case study by applying Semops, a sequential multiobjective problem solving technique which allows the decision maker to trade off one objective versus another in an interactive manner. Semops cyclically uses a surrogate objective function based on goals and the decision maker's aspirations about achieving these goals. The algorithm, applied to a synthetic case study of regional water quality management, demonstrates that (1) a complex situation can be handled, (2) the individuality of the decision maker's preference structure is preserved, (3) the feasible alternatives do not need to be specified a priori, and (4) the concept of a satisfactory solution rather than an optimum solution is more realistic in situations involving conflicting goals. (Bell-Cornell)
W73-13703

MULTIOBJECTIVE SCREENING MODELS AND WATER RESOURCE INVESTMENT,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
J. L. Cohon, and D. H. Marks.
Water Resources Research, Vol 9, No 4, p 826-836, August, 1973. 4 fig, 2 tab, 20 ref.

Descriptors: *River basin development, *Comprehensive planning, *Regional analysis, *Linear programming, Economic efficiency, *Resource al-

location, Resources development, Multiple-purpose projects, Decision making, Optimization, Alternative planning, Constraints, Mathematical models, Systems analysis, *Investment.
Identifiers: *Multiobjective screening models, Environmental quality, Water resource investment, Income benefits.

An application of multiobjective theory to the analysis of development alternatives for a large-scale river basin is presented. A river and its uses represent a complex stochastic physical system embedded in an economic, social, and institutional framework difficult to model. That which endeavors to model analytically the interrelated decision in the context of this physical and nonphysical environment is a screening model. Such a model is an optimization problem which maximizes net discounted benefits subject to continuity constraints on water flow, technological constraints on the alternatives, and policy constraints. Presented is a case study of a river system in which development is to be planned according to national and regional objectives. A linear programming screening model for finding the best set of development alternatives from a national objective point of view is introduced and a brief discussion of methods for handling more than one objective in such models is presented. An analysis of the trade-offs between the two objectives is demonstrated by using a constraint method. The transformation curve between net national income benefits from power and irrigation and regional equity as measured by deviation from an equal regional water distribution is shown. (Bell-Cornell)
W73-13704

FORECASTING WATER USE FOR ELECTRIC POWER GENERATION,
City Univ. of New York. Dept. of Mathematics.
For primary bibliographic entry see Field 06D.
W73-13705

NATIONAL AND INTERREGIONAL MODELS OF WATER DEMAND, LAND USE, AND AGRICULTURAL POLICIES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 06D.
W73-13707

SUGGESTED BASIC GUIDELINES FOR A LONG-TERM PLAN OF ACTION IN THE FIELD OF HYDROLOGY, (QUELQUES REFLEXIONS DE PRINCIPE POUVANT SERVIR DE GUIDE A UN PLAND'ACTION A LONG TERME),
N. I. Chenet.
In: Status and Trends of Research in Hydrology, 1965-74; Proc. of International Conference held at UNESCO Headquarters, December 8-16, 1969, Paris: United Nations Educational, Scientific and Cultural Organization, Paris, p 141-148, 1972.

Descriptors: *Water balance, *Data collections, *International Hydrological Decade, Precipitation (Atmospheric), Hydrology, Surface waters, Groundwater, Sedimentation, Networks, Hydrologic cycle.
Identifiers: *World water balance.

Hydrology's sphere of activities and its key role in water problems are reviewed. The principles on which international cooperation in this field should be founded and, objectives in five basic areas (development of measurement networks; establishment of balances; the study of data for preparing civil-engineering projects; hydrological forecasts; and long-term developments taking into account the influence of man) are discussed. Cooperation between nations, international organizations, governmental organizations and non-governmental organizations is reviewed. The general line of policy should be to define jointly, as clearly and in as great detail as possible, each of the problems to be solved, together with the various components in the corresponding program; to leave to whichever international body so desires the responsibility of proposing and carrying out each of the components of the program, each country being responsible for dealing with its own problems on a national, regional, and international level. It would be desirable to obtain in this way a clear picture of the responsibilities of each organization and to organize more extensive cooperation, involving several institutions, on subjects calling for a synoptic approach. Consideration should be given to the necessity for setting up machinery to enable the governments and international organizations concerned to meet and reach agreement on action. If UNESCO is well placed to host such a body, then it would be important to make a clear distinction between UNESCO's own program and its role as host to this body. Each international organization concerned should agree to accept full responsibility for the part of the program which concerns it, and to report to the deliberative body with a view to agreement on concerted action. (See also W73-13765) (Knapp-USGS)
W73-13774

OPTIMIZING THE SUPPLY OF INLAND WATER TRANSPORT,
Peat, Marwick, Mitchell and Co., Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-13968

A MULTISECTORAL MODEL OF PACIFIC AND MOUNTAIN INTERSTATE TRADE FLOWS,
British Columbia Univ., Vancouver. School of Community and Regional Planning.
H. C. Davis, and M. Lofting.
Available from the National Technical Information Service, $3.00 in paper copy, $1.45 in microfiche. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, Final IWR Report 73-2, January 1973. 125 p. DACW07-69-C-0013.

Descriptors: *Input-output analysis, Model studies, Computer programs, *Regional analysis, Methodology, *Industrial production, Interstate, Water resources development, United States.
Identifiers: *Multisectoral models, *Interstate trade data, *Western U.S.

The report presents a multisectoral model of Pacific and mountain interstate trade flows for 1963. The basic concept of input-output analysis and the general methodology for the report are discussed in Part A, and the eleven Western states inter-industry models are presented in Part B of the report. The 1963 interregional transaction for the eleven states is shown in a 6-part oversize table and is enclosed in the back pocket of the report. (See also W69-05754) (IWR)
W73-13986

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL III.

Available from University of Arizona, Tucson, Dept of Hydrology and Water Resources $22.00/set. Proceedings (Vol III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 934-1661, (1972).

Descriptors: Water resources development, *Planning, *Management, *Decision making, Economics, *Systems engineering, *Data collections, *Stochastic processes, Hydrology, Model studies, Systems analysis, Hydraulics, Water quality, Water quantity, Probability, Optimization, Simulation analysis, Analytical techniques, Projects, Design, Estimating, *Risks.
Identifiers: Subjectivity, Model construction, Socio-economic losses, Errors

This Symposium focuses upon the role of the decision sciences in evaluating uncertainties inherent in water resource planning, design, investment, and operations. In Volume III, there is considerable concern with the role of subjectivity in the use of data and construction of models and with the need for more formal consideration of socioeconomic losses associated with underestimation and overestimation errors. Volume III's first section contains the last 14 papers given. The second section provides a series of general reports, each one serving to review the papers presented in one particular category, at the Symposium. Included are the report of Kisiel and Duckstein on the papers comprising the Symposium subject 'Model Choice and Validation,' and that of P.E. O'Connell covering the papers in the category 'Stochastic and Statistical Models.' Each general report is followed by short discussions, and replies by the author (s) of the paper in question. The volume closes with a list of Symposium participants and the Symposium's schedule. (See W73-12269, W73-13134, and W73-14167 thru W73-14180) (Bell-Cornell)
W73-14166

UNCERTAINTIES IN HYDRAULIC MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. Ince.
In: Proceedings (Vol III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 934-939, (1972).

Descriptors: *Hydraulic models, Engineering, *Design, Model studies, Fluid mechanics, Calibrations, Mathematical models, *Risks.
Identifiers: Prediction.

The role of hydraulic models in engineering design is reviewed. Hydraulic models were frequently employed in design problems defying analytical solutions. Now digital computers allow many fluid mechanics phenomena to be modelled by numerical methods. But many instances remain where hydraulic models are practical and sometimes the only method for prediction of events after the construction of engineering structures, such as certain mobile bed fluvial hydraulic problems, and models of coastal processes. A hydraulic model is particularly valuable when operated conjunctively with a mathematical model. Successful use of these models depends greatly upon the exposure, interpretation and resolution of uncertainties at each step of the study. These steps are, as in all modelling techniques: (1) model calibration; (2) model validation; and (3) model experimentation. For model calibration there are uncertainties: (a) about modelling parameters; (b) in the prototype data; and (c) in instrumentation. The validation of the model is subject to the same uncertainties but usually suffers also from the fact that all data has been used in one form or another for the calibration and there is not sufficient time to collect additional data. (See also W73-14166) (Bell-Cornell)
W73-14167

AN APPROACH TO FORMULATING STRATEGIES FOR FLOOD FREQUENCY ANALYSIS,
Geological Survey, Washington, D.C.
N. C. Matalas, and J. R. Wallis.
In: Proceedings (Vol III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 940-961, (1972). 1 fig, 3 tab, 3 ref.

Descriptors: *Flood frequency, *Analysis, *Monte Carlo method, *Reservoirs, *Design flood, Analytical techniques, Equations, Planning, Management, Probability, Risks.
Identifiers: *Cost minimization, Overdesign, Underdesign.

Monte Carlo experiments are used to determine the strategies--choice of frequency distribution--for minimizing the overdesign, underdesign, and total costs associated with the T ± 50 year reservoir design flood. Given that the real world flood frequency distribution is either a three parameter Pearson Type III or a three parameter log-normal distribution, the choice of distribution is taken to be either a Pearson Type III, a log-normal, or a Gaussian distribution. In general, pure strategies do not exist--the strategies being somewhat dependent upon n, the flood sequence length, and gamma (x), the real world coefficient of skewness for flood events. For n and gamma (x) small, the Gaussian distribution services to minimize the overdesign costs. If the Gaussian distribution is disregarded, the overdesign and total costs are minimized by choosing a log-normal distribution no matter what the real world distribution is. The choice of distribution for minimizing underdesign costs depends upon n, gamma (x), and the real world distribution. These strategies are conditional on the assumed piece-wise linear cost function. (See also W73-14166) (Bell-Cornell)
W73-14168

UNCERTAINTIES IN WATER QUALITY MODELING: THE CASE OF ATMOSPHERIC REAERATION,
Rutgers--The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05G.
W73-14169

ENTROPY IN THE ASSESSMENT OF UNCERTAINTY IN HYDROLOGIC SYSTEMS BEHAVIOR AND IN MATHEMATICAL MODEL PERFORMANCE,
California Univ., Davis.
J. Amorocho, and B. Espildora.
In: Proceedings (Vol III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, Dec 11-14, 1972, p 977-1008, (1972). 6 fig, 1 tab, 3 ref.

Descriptors: *Entropy, *Hydrologic systems, *Mathematical models, *Streamflow, *Runoff, Variability, Basins, California, Simulation analysis, Systems analysis, Equations, Decision making, Evaluation, *Risks.
Identifiers: Historical flow data.

Some uses and limitations of the concept of entropy in assessing the performance requirements of hydrologic models for particular catchments are explored. In representing natural catchment systems with mathematical models, a relatively wide range of choice exists among models of various degrees of completeness and sophistication. Considering cost, as well as appropriateness of a model for a particular purpose, it is desirable to have an objective criterion to make this selection. Entropy, as used in information theory, provides one such criterion. Entropy is a measure of the degree of uncertainty of a particular outcome in a process; therefore, in dealing with the prediction of a hydrologic variable, such as streamflow, one can compute the entropy of this variable from historical data, thus characterizing the unexpectedness or variability inherent in the process. This represents a property of the system and is called marginal entropy. It is likewise possible to evaluate the uncertainty of the predictions made by a given mathematical model of the catchment by comparing these predictions with the measured flow. This is done through conditional entropy. By combining these two entropy functions, 'transinformation' is obtained, providing an objective evaluation of the goodness of the model. These criteria were applied to a basin for which a number of years of historical flow record and concurrent model simulations were available. (See also W73-14166) (Bell-Cornell)
W73-14170

COMPARISON OF STATISTICAL AND DETERMINISTIC APPROACHES IN THE DETERMINATION OF HYDROLOGICAL PARAMETERS OF AQUIFERS,
Bundesanstalt fuer Bodenforschung, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 02F.
W73-14171

A METHODOLOGY FOR TESTING SYSTEM THEORETIC MODELS,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
J. J. Rogers.
In: Proceedings (Vol III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, Dec. 11-14, 1972. p 1029-1038, (1972). 5 ref, 1 append.

Descriptors: *Systems engineering, *Methodology, *Testing, *Mathematical models, *Theoretical analysis, Decision making, Systems analysis, Water resources.

The objectives of testing system models are to determine whether or not they are acceptable with respect to the real world and to determine the validity and extendability of the models throughout, and perhaps outside of, their intended area of application. The problem is essentially of a decision-theoretic nature and hence probabilistic considerations become important. The entire procedure of model development, testing, validation and choice can be treated within the formal framework of the mathematical theory of systems engineering proposed by A. Wayne Wymore. Wymore's theory provides a rigorous, comprehensive, powerful methodology capable of testing and validating a model throughout its intended area of application, and capable of handling extremely large and complex modeling programs. These abilities will undoubtedly be a necessity in the development of ecosystem models and ecological management systems. (See also W73-14166) (Bell-Cornell)
W73-14172

A PLANNING MODEL FOR PRELIMINARY NETWORK DESIGN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-14173

UNCERTAINTIES RESULTING FROM MAN-MADE STRUCTURES,
For primary bibliographic entry see Field 08A.
W73-14174

DESIGNING RESERVOIR CONTROL POLICIES WITH CHANCE CONSTRAINED PROGRAMMING,
London Graduate School of Business Studies (England).
M. Lane.
In: Proceedings (Vol. III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, Dec. 11-14, 1972. p 1081-1104, (1972). 1 fig, 4 tab, 23 ref, 1 append.

Descriptors: *Model studies, *Reservoir design, *Irrigation water, *Optimization, *Size, Hydrology, Agriculture, Crops, Rainfall, Management, Reservoir releases, Reservoir storage, Water demand, Constraints, Decision making, Systems analysis.
Identifiers: *Chance-constrained programming, *Linear decision rule, Operating policies, Control policies.

Some of the issues involved in using chance constraints for designing water resource systems and their optimal operating policies are explored, via a numerical example. A conditional chance constrained model for the Irrigation Problem is presented together with its numerical solution; it is analyzed and then contrasted with two alternative models of the same system when slightly different assumptions are made about system operation. The first alternative model assumes a different informational structure in the linear decision rule that is used to characterize reservoir operating policy. This comparison produces some conclusions about the nature of optimal decision rules and their information base. The second model comparison reveals that the pre-specified levels of probability with which the constraints are required to hold, may not be optimal for the specified class of decision rules. Significantly, it is shown that the amendments that need to be made to the required probability levels may be gained using dual information and parameterizing. Dual information from chance constrained models has hitherto been unexploited, but it clearly represents an important contribution from these models. This is further demonstrated by the derivation, from the dual, of a differential water pricing scheme that may be used to decentralize the agricultural decision. (See also W73-14166) (Bell-Cornell)
W73-14175

A GROUND-WATER PLANNING MODEL - A BASIS FOR A DATA COLLECTION NETWORK,
Geological Survey, Washington, D.C.
T. Maddock, III.
In: Proceedings (Vol. III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 1105-1130, (1972). 1 fig, 10 tab, 5 ref.

Descriptors: *Groundwater, *Management, *Planning, *Operation and maintenance, Economics, Pumping costs, Arid lands, Hydrologic aspects, *Optimization, Data collections, Systems analysis, Mathematical models.
Identifiers: *Mixed integer programming, *Separable programming, Cost minimization, Sensitivity analysis, Error analysis.

Efficient groundwater management endeavors to: (1) determine the least cost operation of existing wells; (2) determine the least cost spatial and temporal development of new wells; and (3) determine a least cost transport system to move the pumped water to a central location. Mixed integer programming provides a planning and management model that yields the desired information. The model is tested using an example, hypothetical groundwater system typical of those encountered in arid regions. A sensitivity and error analysis is applied to the model to determine the response of the management and planning activities to economic factors such as well drilling, pumping and pipeline costs, and to hydrologic factors such as the transmissivity and storage coefficients. The response is measured in terms of costs associated with the model's parameter estimation errors, as measured by losses of profit. The sensitivity analysis determines a ranking of factors in terms of their error effects and in terms of priority for further data collection activities. (See also W73-14166) (Bell-Cornell)
W73-14176

SUBJECTIVE INPUTS AND UNCERTAINTY IN DECISION PROBLEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
W. R. Ferrell.
In: Proceedings (Vol. III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 1131-1145, (1972). 43 ref.

Descriptors: *Decision making, *Probability, Measurement, Value, Estimating, Data collec-

tions, Analytical techniques, Mathematical models, Operations research, *Risks.
Identifiers: *Subjective inputs, Errors, Judgment, Human performance.

Much current thinking about decision making is dominated by the modern conception decision theory problem. Although that conception would appear to offer the ultimate in objectivity, it is founded, in each particular case, upon subjective judgements, and the quantities that characterize it depend upon subjective estimation. Subjective inputs to decision making are a necessity, not just a compromise that msut be tolerated. Creative, valuational, and judgmental inputs are required both to formulate a decision theory problem and to make the measurements needed to solve it. One type of judgmental input, the estimation or expression of probabilistic information is considered in some detail. Evidence indicates that people can accurately express directly-experienced and well-understood characteristics of probabilistic phenomena, but that some fairly simple statistical properties are counter-intuitive. Care must be taken in checking and calibrating probability and parameter estimates, and one must be alert to possible bias due to the response mode. Work on man-machine cooperation in probability revision indicates the importance of avoiding unnecessary operations at which man's subjective performance is relatively poor, such as computation or aggregation of the impact of evidence. However, man's ability to compare, quantitative through likelihood ratios, implicit models of possible states of the world is remarkable and can be usefully exploited. (See also W73-14166) (Bell-Cornell)
W73-14177

INTUITION, POLICY AND MATHEMATICAL SIMULATION,
British Columbia Univ., Vancouver. Resource Science Center.
J. Kane.
In: Proceedings (Vol. III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 1146-1166, (1972). 1 fig, 3 ref.

Descriptors: *Simulation analysis, *Computer programs, *Canada, Evaluation, Psychological aspects, Mathematical models.
Identifiers: *Subjective inputs, *Environmental policy, Philosophical attitudes, Data, Group activity.

The role of intuitive or subjective inputs to environmental simulation models is discussed. The main problem in structuring such inputs for the computer has been one of inappropriate format -- intuition and opinion have been treated as confused arithemtic messages when in fact they are trying to communicate geometric information. With this insight, it becomes relatively simple to develop computer languages which can readily combine subjective evaluation with quantitative data. A mathematical language, KSIM, has been developed which articulates what people sense to be the relationships between a number of interacting variables. The use of KSIM is discussed and the results of its application in matters affecting Canadian environmental policy are described. In particular, the psychological and philosopical attitudes that were found necessary to foster before such group activity results in effective modeling efforts are described. (See also W73-14166) (Bell-Cornell)
W73-14178

SOME CURRENT PROBLEMS OF RAIN STIMULATION RESEARCH,
California Univ., Berkeley. Statistical Lab.
For primary bibliographic entry see Field 03B.
W73-14179

FIRST-ORDER ANALYSIS OF MODEL AND PARAMETER UNCERTAINTY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
C. A. Cornell.
In: Proceedings (Vol. III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 1245-1274, (1972). 2 fig, 20 ref.

Descriptors: *Model studies, *Probability, *Stochastic processes, Engineering, Hydrology, Analytical techniques, Operations research, Rainfall, Streamflow, Basins, Storms, Runoff, Equations.
Identifiers: *First-order analysis, Model uncertainty, Parameter uncertainty, Conditional analysis.

Tools and illustrations of first-order uncertainty analysis are reviewed, using hydrologic examples. Use of this analysis procedure makes practical more realistic modeling of engineering problems since it works with only first- and second-order moments of random variables and processes, and, if necessary, reduces non-linear functional or system relationships to linear ones in terms of the random (deviation from the mean) component of any dependent variables. The modeling can include uncertainty in the physical models used and in the parameters of those models. In particular, the moments of the random variables may be uncertain. These basically subjective uncertainties may propagate differently in the model than the uncertainty in the random variables. First-order Bayesian statistical operations are introduced to permit the combination of encoded prior information and observed data. (See also W73-14166) (Bell-Cornell)
W73-14180

6B. Evaluation Process

THE IMPACT OF RESERVOIR RECREATION ON THE WHITNEY POINT MICROREGION OF NEW YORK STATE,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
R. C. Hinman.
Available from the National Technical Information Service as PB-222 994, $6.00 in paper copy, $1.45 in microfiche. Technical Report No 18, August 1969. 73 p, 1 fig, 1 chart, 23 tab, 41 ref, 1 append. OWRR B-002-NY (5). 14-01-0001-823.

Descriptors: *Reservoirs, *Recreation, *Economic impact, *Regional analysis, *New York, *Input-output analysis, Surveys, Estimating, Recreation demand, Resource allocation, Economies, Regions, Lakes, Summer, Systems analysis, Mathematical models.
Identifiers: *Whitney Point (NY), Water-based recreation, Microregions.

Increased income, more leisure time, and improved transportation systems enable Americans to allocate more time to recreational activities. Of particular importance to this study is the continued increase in demand for outdoor recreation. Governmental legislation and grants and other public, as well as private, sources have been supporting resource allocation to insure the availability of outdoor recreational benefits to the American people. The economic impact of introducing reservoir recreation on the economy of the Whitney Point Microregion in Central New York State is analyzed. The setting, background and development of the Whitney Point Reservoir recreation area are discussed. The two methods used to evaluate the economic impact are: (1) A user survey, conducted to determine such factors as the magnitude and type of expenditures incurred by reservoir users in the micro-region, the origin and number of users, and other pertinent factors; and (2) Input-out analysis, which relies on a business-government-household survey. These methods are presented and their empirical results are evaluated. The introduction of reservoir recreation at Whitney Point has been a mild, seasonal stimulant to economic growth. Introduction of a summer lake and accompanying recreational facilities has been an asset to the rural residential environment, it is likely to attract new residents in the future. (Bell-Cornell)
W73-13661

FORECASTS FOR THE FUTURE-POPULATION,
Geological Survey, Carson City, Nev. Water Resources Div.
V. R. Hill.
Nevada Water Planning Robert 5, February 1973. 76 p, 23 fig, 4 map, 24 tab, 30 ref, 3 append

Descriptors: *Population, *Nevada, Water resources development, *Planning, Human populations, Urbanization, Water use, Water requirements, Forecasting.
Identifiers: *Population forecasting.

Graphic techniques recently developed are applied to decennial census data for Nevada to predict how many people and their location by county, hydrographic region and size of place, in the 1970 to 2020 period. Municipal-industrial water use projections are made for Nevada counties and hydrographic regions in the 1970 to 2020 period. The national population is predicted for the same period. Net migration into Nevada is large compared to natural increase. This average relative importance is 2 1/2 to one. Nevada natural increase rate for the 1960 decade was calculated from its components of birth rate and death rate, and comparisons were made with U.S. data, as published in the 1970 Statistical Abstract of the United States. Nevada's birth rate during this period has averaged 11% higher and the death rate 14% lower than the U.S. Recent data indicate that the associated natural increase ratio is widening. Nevada's projected high population curve yields 1.8 million people in 2020. If the trend established by Nevada in the 1950-1970 period were to be extended to 2020, there would be about 7.2 million people in Nevada. (Knapp-USGS)
W73-13674

A SYNOPSIS OF THE NATIONAL WATER COMMISSION'S FINAL REPORT.
Water Resources Council, Washington, D.C.

June 1973. 92 p.

Descriptors: *National Water Commission, *Legislation, *Water resources development, Water law, Federal government, Water management (Applied), Planning.

A Synopsis of the final report of the National Water Commission 'Water Policies for the Future' (See W73-12052) contains the introductory paragraphs from each chapter and section and all the Commission's conclusions and recommendations of the policies which it believes the Nation should adopt for the efficient, equitable, and environmentally responsible management of its water resources. The Commission has examined virtually the entire range of water resources problems facing the Nation, including the effects of water management on the Nation's economy and on its environment. The problems of reconciling Federal and State water law have been addressed, as have the problems of integrating groundwater and surface water management. The important purposes for which water is used have been studied, and appropriate policies have been drawn. Ways in which existing water supplies can be used more efficiently and present supplies can be augmented have also been examined. Standards by which interbasin transfers of water have been developed and ways in which water management can be im-

proved have been formulated. The financing of future water programs as well as the important question of costs are also addressed. Specific recommendations are included for action at the Federal, State, and local levels. (Knapp-USGS)
W73-13676

PUBLIC INVESTMENT IMPACTS AND REGIONAL ECONOMIC GROWTH,
Utah State Univ., Logan. Dept. of Economics.
W. C. Lewis.
Water Resources Research, Vol 9, No 4, p 851-860, August 1973. 3 fig, 2 tab, 14 ref, append.

Descriptors: Water resources development, *Investment, *Regional development, *Regional economics, *Industries, Costs, Model studies, Decision making.
Identifiers: Economic growth, Predicting, Public investment.

Ideas and concepts are articulated which extend the theory underlying the role of public investment, including investment in water resources development, in the process of regional economic growth. Hypotheses concerning interdependencies among public investment impacts are investigated in the context of an industrial location model of regional growth. The model is used to demonstrate the possibility that, because of external economies associated with the development of private activities in a region and the existence of minimum-sized thresholds for the appearance of other activities, there are interdependencies among seemingly independent investment impacts. The analysis suggests that construction impacts as well as developmental impacts should be considered in the investment decision-making process. Implications for the growth center strategy for regional development are also discussed. The analysis offered is essentially conceptual and interpretive, tendering only limited empirical evidence in support of the ideas. (Bell-Cornell)
W73-13702

INTERACTIVE MULTIOBJECTIVE PROGRAMING IN WATER RESOURCES: A CASE STUDY,
Colorado Univ., Boulder. Graduate School of Business.
For primary bibliographic entry see Field 06A.
W73-13703

FORECASTING WATER USE FOR POLICY MAKING: A REVIEW,
Houston Univ., Tex. Dept. of Quantitative Management Science.
For primary bibliographic entry see Field 06D.
W73-13706

A RIVER BASIN MANAGEMENT POST-AUDIT AND ANALYSIS,
Little (Arthur D.), Inc., Cambridge, Mass.
J. M. Wilkinson.
Available from the National Technical Information Service as PB-222 941, $6.50 in paper copy, $1.45 in microfiche. Final Report, August 1973. 275 p, 3 fig, 25 tab, 238 ref. OWRR C-3353 (3719) (1).

Descriptors: *River-basins, *Planning, *Institutions, *Water law, *Water policy, Administration, State governments, Coordination, Missouri River, *Regional analysis, Management, *Interstate compacts, Interstate rivers.
Identifiers: *Missouri River Basin.

The water management history of the Pick-Sloan Missouri River Basin Program was analyzed with particular emphasis on federal, State, local and non-government institutional arrangements and an evaluation of performance of these institutions over a 28-year period, 1944-1972. The statutory bases for these institutions was documented. Performance criteria included effectiveness in regional policy, planning, programming and operational management and their responsiveness to social change. The regional economy was compared in 1940 and 1970, in the light of expectations of the original plan and actual realization of intended results, with emphasis on the role of water. The analysis prompted recommendations for new institutional re-orientations for the future that would better serve the needs of multi-State regionalism.
W73-13715

STATUS AND TRENDS OF RESEARCH IN HYDROLOGY, 1965-74.
For primary bibliographic entry see Field 02A.
W73-13765

SUGGESTED BASIC GUIDELINES FOR A LONG-TERM PLAN OF ACTION IN THE FIELD OF HYDROLOGY, (QUELQUES REFLEXIONS DE PRINCIPE POUVANT SERVIR DE GUIDE A UN PLAND'ACTION A LONG TERME),
For primary bibliographic entry see Field 06A.
W73-13774

SURVEY OF ESTUARINE SITE DEVELOPMENT LAGOON HOMEOWNERS, OCEAN COUNTY, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Resources.
G. H. Nieswand, C. W. Stillman, and A. J. Esser.
Available from the National Technical Information Service as PB-223 012, $3.50 in paper copy, $1.45 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, July 1973. 59 p, 4 fig, 1 tab, append. OWRR B-040-N.J. (2).

Descriptors: *Lagoons, *Sites, *Recreation demand, Estuaries, Resource development, Wetlands, *Attitudes, *New Jersey.
Identifiers: *Public attitudes, Housing.

A large number of estuarine site development lagoon systems have been constructed along the New Jersey shore with little, if any, knowledge regarding the true nature of the system being created and its impact on the exiting natural estuarine systems. As part of a comprehensive study and evaluation of these lagoon systems, a questionnaire survey of estuarine site development lagoon homeowners in Ocean County, New Jersey was conducted in the spring of 1972. The purpose of this survey was to characterize lagoon development in terms of the individuals who purchase and live in lagoon homes, the use of these homes and the utilization of the resources of the area by residents. The results indicate that residents are generally quite satisfied with their lagoon homes. In spite of perceived major problems of pollution and over-development, very few homeowners indicate an intent to sell their homes. A large number of seasonal residents intend to convert their homes to year-round residences. Although a substantial number of lagoon homes are used as seasonal residences, the majority are used as year-round residences, with a large number of the permanent residents being retired. As would be expected, the most popular recreational activities among lagoon residents include swimming, motor boating, fishing, rest and relaxation, and crabbing and shellfishing, with most recreational time being spent on a resident's own property or on lagoon or bay waters.
W73-13818

ECONOMICS OF WATER POLLUTION CONTROL,
Economic Research Service, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-13837

RESEARCH IN SUPPORT OF PLANNING AND MANAGEMENT OF WATER AND RELATED LAND RESOURCES,
Federal Council for Science and Technology, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13939

PROCEDURES USED IN THE UNITED KINGDOM FOR INTEGRATING INFORMATION NEEDED IN WATER MANAGEMENT DISCUSSIONS,
Department of the Environment, London (England). Water and Sewage Div.
For primary bibliographic entry see Field 06E.
W73-13956

THE GERMAN GENERAL WATER SCHEME AS A MEANS FOR INTEGRATING DECISION MAKING INFORMATION,
Bundesministerium des Innern, Bonn (West Germany).
For primary bibliographic entry see Field 06E.
W73-13957

OPTIMIZING THE SUPPLY OF INLAND WATER TRANSPORT,
Peat, Marwick, Mitchell and Co., Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-13968

MARGINAL ECONOMICS APPLIED TO PIPELINE DESIGN,
Toltz, King, Duvall, Anderson and Associates, St. Paul, Minn.
For primary bibliographic entry see Field 04A.
W73-13969

COMPLEX USE OF WATER RESOURCES (KOMPLEKSNOYE ISPOL'ZOVANIYE VODNYKH RESURSOV).
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 04A.
W73-14139

OUTDOOR AMERICA--A PLAN FOR PROVIDING RECREATION OPPORTUNITIES TO THE NATION.
Bureau of Outdoor Recreation, Washington, D.C.

Available from NTIS, Springfield, Va 22151 as PB-215 187, Price $6.00 printed copy; $1.45 microfiche. First Draft report, February 16, 1973. 321 p.

Descriptors: *Recreation, *Recreation facilities, *Recreation demand, United States, Planning, Reviews, Evaluation, Social needs, Economics, Water utilization.
Identifiers: *Outdoor recreation plan (USA).

This Nationwide Outdoor Recreation Plan is the result of a long-building recognition of the need for recreation planning on a national scale. The use of leisure time and participation in outdoor recreation activities has gradually been coming into focus as a part of everyday living which should receive more than just passing attention from government, educational institutions and business. Despite the continuing growth in outdoor recreation, there are many Americans who have not yet been able to 'join in the action' or even watch it. These are the people who don't have recreation opportunities readily available to them. Because of economics, age, physical or mental handicaps, or just living where opportunities don't exist, they go without. This plan, therefore, addresses itself not only to the ramifications of the recreation boom, but also to what for many is a recreation bust. (Woodard-USGS)
W73-14165

SUBJECTIVE INPUTS AND UNCERTAINTY IN DECISION PROBLEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 06A.
W73-14177

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

PRICE ELASTICITY OF DEMAND FOR MUNICIPAL WATER: A CASE STUDY OF TUCSON, ARIZONA,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 06D.
W73-13698

CONVENTIONAL AND UNCONVENTIONAL ALTERNATIVES FOR WATER SUPPLY MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 04A.
W73-13701

PUBLIC INVESTMENT IMPACTS AND REGIONAL ECONOMIC GROWTH,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-13702

THE PRICE TAG TO STOP FEEDLOT RUN-OFF,
For primary bibliographic entry see Field 05D.
W73-13843

GERMAN APPROACHES TO PAYING COSTS OF WATER MANAGEMENT PROGRAMMES,
Bundesministerium des Innern, Bonn (West Germany).
For primary bibliographic entry see Field 06E.
W73-13958

FINANCING COSTS OF WATER POLLUTION CONTROL IN SWEDEN,
National Swedish Environment Protection Board, Stockholm. Water Quality Dept.
For primary bibliographic entry see Field 06.
W73-13959

TREATED WATER STORAGE FOR DESIGN CAPACITY REDUCTION,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W73-13967

6D. Water Demand

THE IMPACT OF RESERVOIR RECREATION ON THE WHITNEY POINT MICROREGION OF NEW YORK STATE,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06B.
W73-13661

PRICE ELASTICITY OF DEMAND FOR MUNICIPAL WATER: A CASE STUDY OF TUCSON, ARIZONA,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. A. Young.
Water Resources Research, Vol 9, No 4, p 1068-1072, August 1973. 1 fig, 2 tab, 5 ref.

Descriptors: *Water supply, *Municipal water, *Pricing, *Elasticity of demand, *Consumptive use, *Statistical methods, Regression analysis, Time series analysis, Least squares method, Rainfall, *Arizona.
Identifiers: *Tucson (Ariz)

The characteristics of the demand for municipal water supplies can be used by water authorities to predict the response of consumers to changes in water pricing policies and to provide a basis for long-term consumption forecasts. Consumer response to price is conveniently measured by the concept of 'price elasticity of demand,' defined as the percentage in quantity consumed associated with a 1% change in price. Procedures and results are reported of a statistical analysis of the forces influencing water consumption in Tucson, Arizona, using time series data. Estimates of the price elasticity of demand for municipal water were derived by statistical regression. Regression coefficients relating consumption to price and rainfall were estimated using conventional least squares procedures. A significant shift in demand was found to have occurred subsequent to 1964. The price elasticity was estimated at about -0.63 during 1946-1964 and -0.41 during 1965-1971. These results are consistent with those obtained in other urban water demand studies of the arid parts of the western United States. The data subjected to statistical analysis were for one community, in contrast to the more typical approach using cross-sectional observations of a number of communities during a specific time period. (Bell-Cornell)
W73-13698

FORECASTING WATER USE FOR ELECTRIC POWER GENERATION,
City Univ. of New York. Dept. of Mathematics.
H. P. Young, and R. G. Thompson.
Water Resources Research, Vol 9, No 4, p 800-807, August 1973. 4 fig, 5 tab, 13 ref.

Descriptors: *Water supply, *Water demand, *Electric power industry, *Water withdrawal, *Water consumption (Except consumptive use), *Forecasting, Freshwater, Pricing, Analysis, Effluents, Standards, Taxes, Cooling, Methodology, Alternative planning.
Identifiers: *Heat discharge, Demand analysis.

Knowledge of demand functions for water and electricity provides a basis for forecasting water withdrawals, water consumption, and heat discharges to the water in electric power generation. The variables in these demand functions may be significantly affected by direct and indirect variations in policy. A major difficulty in recent studies devoted to forecasting future levels of water use to determine the adequacy of water supplies is that the demands for water are forecast as 'requirements.' Unfortunately, use of the term requirements carries the implication that water demands cannot be substantially altered, and there is little use in knowing that water demands are going to outstrip supplies unless a framework is provided for analyzing how demands (or supplies) can be changed. Various factors affecting demand for water withdrawals and consumptive use for a particular economic sector electric power generation are discussed. Forecasts of water withdrawals and consumption of water are made for alternative combinations of the variables in the demand functions and compared with the results of previous studies in which water demands were forecast as 'requirements.' This type of analysis if carried out systematically for all the major water-using industries should provide information better than that presently available for planning future policy. (Bell-Cornell)
W73-13705

FORECASTING WATER USE FOR POLICY MAKING: A REVIEW,
Houston Univ., Tex. Dept. of Quantitative Management Science.
R. G. Thompson, and H. P. Young.
Water Resources Research, Vol 9, No 4, p 792-799, August 1973. 3 fig, 12 ref.

Descriptors: *Water demand, *Water use, *Forecasting, *Estimating, Water policy, Projects, Electric power industry, Withdrawal, Equations, Investment, Prices, Cost analysis, Linear programming, Mathematical models, Systems analysis.
Identifiers: Cost minimization, Demand analysis.

This study reviews the basis for estimating withdrawal, consumptive, and disposal demand functions for water in production. The derived demand function for water is the basis for forecasting water use in production. Substituting inputs in production is the key idea underlying derived demand functions for water. The form of the derivation is illustrated for certain types of substitutions in a steam electric generating plant. A linear method of approximating derived demand functions is discussed, references to previous studies in agriculture and petroleum refining are made. Several demand functions estimated in this way are then used to evaluate proposed investments in water resource regulation. The most important application of the withdrawal, consumptive, and disposal demand functions is that they allow alternative projections of water use by systematically varying the factors that influence the demand for water. The second application is that the demand function provides a basis for evaluating whether or not specific investments in flow regulation or interbasin transfers are justified by the demand for the water that these projects would provide. (Bell-Cornell)
W73-13706

NATIONAL AND INTERREGIONAL MODELS OF WATER DEMAND, LAND USE, AND AGRICULTURAL POLICIES,
Iowa State Univ., Ames. Dept. of Economics.
E. O. Heady, H. C. Madsen, K. S. Nicol, and S. H. Hargrove.
Water Resources Research, Vol 9, No 4, p 777-791, August 1973. 10 fig, 2 tab, 11 ref.

Descriptors: *Mathematical models, *Water demand, United States, *Land use, *Agriculture, *Resource allocation, *Water supply, *Pricing, Marketing, Irrigation water, Regions, Human population, Crops, Foods, Fiber crops, Reservoirs, Economics, Equations, Systems analysis, Optimization, Planning.
Identifiers: Interregional analysis, Cost minimization.

A study is presented of the optimum allocation of land and water resources in 223 agricultural land regions, 51 water supply regions, and 27 market regions of the United States. The study is built upon a family of programming models which incorporate all major U.S. agricultural commodities into a supply-demand and resource use interaction, and endeavors primarily to determine whether or under what conditions the nation has enough water to produce its future food and fiber requirements under urban and industrial water demands reflected in various levels and distributions of population and national economic activity in the year 2000. The amount of water used in agriculture is partly a function of the prices of water for irrigation; hence an auxiliary objective is to formulate models to reflect (normatively) the demand for water under different pricing policies. Analyzed are the impacts of future alternatives on the demand for water, such as water prices, population levels, farming technology, export quantities, and agricultural policies. In general, results show that, if agricultural and water development policies were changed over the future, the nation would not be faced with an overall water scarcity, and even surplus food producing capacity could exist with the use of less water for agricultural purposes. (Bell-Cornell)
W73-13707

OUR WATER -- A PROBLEM CONCERNING THE STATE, INDUSTRY AND CITIZENS (UNSER WASSER -- EIN PROBLEM, DAS STAAT, INDUSTRIE UND BUERGER BETRIFFT).

Allgemeine Papier-Rundschau, No 33, p 1192, Aug. 21, 1972.

Descriptors: *Water supply, *Water management, *Water shortage, *Water resources development, Europe, *Consumptive use, *Water consumption, Water types, Surface waters, Groundwater, Spring waters, Capital, Loans, Investment, Governments, Federal government, State governments, Public utilities, Water distribution (Applied), Industrial water, Treatment facilities, Water quality control, Water requirements, Financing, Planning, Coordination.
Identifiers: *Germany.

In 1970, public water utilities in the German Federal Republic conveyed 4,218 million cu m of water, 3.9% more than in 1969. Surface waters accounted for 34% of this volume, with indications of further increases, while the proportion of spring waters dropped to 16.1%. The groundwater proportion remained constant at 50.2%. The daily per-capita consumption of domestic water increased to 119 liters for direct household use, but came to 222 liters, or 2.8% above the 1969 figure, per inhabitant of the areas supplied by West German water utility agencies. Industrial water requirements show a similar upward trend, aggravated by short-term peak demands, owing to production fluctuations in factories. The general need for expansion of public water supply facilities will require canalization investments of about 1.5 billion German marks before 1980, while treatment installations for water quality protection may call for a capital outlay of about 600 million marks. About 450 million marks annually may be needed for industrial water supply and treatment installations. Federal, state, and local cooperation are essential to meeting these diverse needs and to the speedy development of the essential plans and constructions. Easier loan policies and other measures are under consideration by the Bonn government. (Brown-IPC)
W73-14049

USE OF MIXED MEDIA IN WATER PLANT FILTRATION,
Mead Papers, Inc., Kingsport, Tenn.
J. K. Sullins.
In: TAPPI Environmental Conference, 1972. Proceedings of Meeting, Houston, Texas, May 14-17, 1972. TAPPI, Atlanta, Ga., p 75-79, 1972. 2 tab.

Descriptors: *Water purification, *Filters, Filtration, *Pulp and paper industry, *Tennessee, Treatment facilities, Water treatment, Freshwater, Industrial water, Pre-Treatment (Water), *Waste water treatment.

The planning, development, and installation of gradually improved water treatment facilities at the pulp and paper mill of the Mead Corp. at Kingsport, Tennessee, are described. The most recent improvement involved the conversion of two conventional gravity filters for river water to triple-media, high-rate filters. The advantages of the expended installation are outlined. (See also W73-14050) (Brown-IPC)
W73-14052

WATER RESOURCES OF THE YELLOWSTONE RIVER VALLEY, BILLINGS TO PARK CITY, MONTANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14115

6E. Water Law and Institutions

WATER LANDS AND BOUNDARIES,
Oregon State Univ., Corvallis. School of Law.
C. L. Clark.
Available from the National Technical Information Service as PB-222 963, $3.50 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Partial Completion Report WRRI-18, June 1973. 65 p. OWRR A-002-ORE (5).

Descriptors: *Water law, *Boundaries (Property), Water rights, Swamps, *Oregon, Legal aspects, *Ownership of beds, Accretion (Legal aspects).
Identifiers: *Oregon water law, Tidelands, Water marks.

Legal aspects of the following topics have been reviewed: classification of waters as affecting title to water lands; navigability; ownership and rights in waterlands: beds of bodies of water; private ownership of beds; tidelands and other submersible lands; wharfage rights; right of access; determining boundaries of water lands: accretion, relicition, and avulsion; right to accretions; meander lines as boundaries; locating the thread of a stream; locating high and low water marks; locating high and low tide lines; other water related lands; islands; swamp lands; and recent developments.
W73-13655

A SYNOPSIS OF THE NATIONAL WATER COMMISSION'S FINAL REPORT.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-13676

A RIVER BASIN MANAGEMENT POST-AUDIT AND ANALYSIS,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06B.
W73-13715

INFLUENCE OF MAN ON THE HYDROLOGICAL CYCLE: GUIDELINES TO POLICIES FOR THE SAFE DEVELOPMENT OF LAND AND WATER RESOURCES.
For primary bibliographic entry see Field 02A.
W73-13767

SUGGESTED BASIC GUIDELINES FOR A LONG-TERM PLAN OF ACTION IN THE FIELD OF HYDROLOGY, (QUELQUES REFLEXIONS DE PRINCIPE POUVANT SERVIR DE GUIDE A UN PLAND'ACTION A LONG TERME),
For primary bibliographic entry see Field 06A.
W73-13774

ANIMAL WASTE DISPOSAL,
Montana State Dept. of Health, Helena. Div. of Environmental Sanitation.
For primary bibliographic entry see Field 05G.
W73-13825

HOW MUCH MANURE PER ACRE.
For primary bibliographic entry see Field 05G.
W73-13850

A MODEL WATER CODE, WITH COMMENTARY,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 04A.
W73-13857

THE DIMENSIONS OF COASTAL ZONE MANAGEMENT.

Proceedings of the Annual Meeting of the Coastal States Organization, Seattle, Washington, July 28-30, 1971. 167 p.

Descriptors: *Seashores, *Coasts, *Land management, *Legal aspects, Water quality control, Planning, Administration, Coastal engineering, Harbors, Shore protection, Jurisdiction, Continental shelf, Governmental interrelations, Land use, Coastal plains, Legislation.
Identifiers: *Coastal zone management.

Current status of coastal zone matters was reviewed from the viewpoints of the state, local, and federal governments. Also, the development of a state coastal zone legislative program as a model for the states to follow was a key purpose of the conference. Recent legislation passed in this area by both the states and the federal government was discussed. Of great concern to the states and federal governments is the continental shelf. In recent years the coastal states have become increasingly aware of the potential wealth in living non-living resources available near the shores. Also, water quality management and standards was discussed at length because of its close interrelationship to coastal zone management. The international aspects of coastal zone mangement and private industry's relationship to coastal zone management were also discussed. (Mockler-Florida)
W73-13858

THE WETLANDS STATUTES: REGULATION OR TAKING,
For primary bibliographic entry see Field 05G.
W73-13859

THE DRAFT UNITED NATIONS CONVENTION ON THE INTERNATIONAL SEABED AREA--DEPARTMENT OF DEFENSE CONSIDERATIONS,
L. Finlay.
Natural Resources Law, Vol 4, p 84-87, January 1971.

Descriptors: *International law, *Beds, *Military aspects, *Treaties, *United Nations, Legislations, Continental shelf, Governments, Jurisdiction, Legal aspects, International waters, International commissions, Governmental interrelations, Law of the sea.
Identifiers: Territorial waters, Customary law.

The present Defense Department position relative to the Draft United Nations Convention on the International Seabed seeks to achieve a degree of absolute freedom beyond the 200-meter isobath that is unattainable. With respect to military uses of the seabed beyond the territorial sea, the U.S. would be much better off with a broad continental shelf governed by the Geneva Convention on the Continental Shelf and customary international law rather than under the August 3 draft treaty. Whether a particular unspecified military use qualifies as a high seas freedom will depend upon a balancing of the interests of the coastal state against the interests of the community of nations as a whole and not on the much used doctrine of creeping jurisdiction. Under the August 3 draft treaty, final decisions would be in the hands of a tribunal over whose membership the U.S. would have no control and whose decisions could not be flouted without being at odds with the entire international community. (Mockler-Florida)
W73-13862

THE REFUSE ACT OF 1899: ITS SCOPE AND ROLE IN CONTROL OF WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W73-13863

LEGISLATIVE RESPONSES TO AIR AND WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W73-13864

AN EXAMINATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Washington and Lee Univ., Lexington Va.
For primary bibliographic entry see Field 05G.
W73-13865

OIL POLLUTION AND THE BRUSSELS CONVENTION,
For primary bibliographic entry see Field 05G.
W73-13866

STATE LEGISLATION CONCERNING MARINE POLLUTION FROM VESSELS,
For primary bibliographic entry see Field 05G.
W73-13867

DEEP WATER PORTS.

Hearing--Subcomm. on Air and Water Pollution, Comm. on Public Works, U.S. Senate, 93rd Cong, 1st Sess, February 26, 1973. 93 p, 1 map.

Descriptors: *Federal Water Pollution Control Act, *Oil pollution, *Legislation, *Ports, Water pollution control, Comprehensive planning, Legal aspects, Harbors, Environmental engineering, Coasts, Oceans, Oil spills, Environmental effects, Governmental interrelations, State jurisdiction.
Identifiers: *Deepwater ports, *Congressional hearings.

S.180 and S.836 would amend the Federal Water Pollution Control Act in order to require the approval of adjacent coastal states prior to the construction of certain offshore facilities. The bills are aimed primarily at the construction of deepwater ports off the coast of the United States. The environmental impact on coastal areas adjacent to deepwater ports has only been dealt with sketchily to date with studies relying heavily on state and local control of land use. This proposal would insure that comprehensive studies at all levels of government be accomplished prior to initiation of construction. The proposals would amend title IV of the Federal Water Pollution Control Act by adding a section requiring that prior to federal licensing, approval, or construction of any ship docking, electric generating, or other facilities beyond the territorial sea, the approval of each adjacent coastal state which might adversely be affected by pollution from such facilities must be secured. The Environmental Protection Agency would be coordinate the program. S.180 would not apply to facilities constructed under leases pursuant to the Outer Continental Shelf Lands Act. (Mockler-Florida)
W73-13868

A BILL TO TERMINATE AND TO DIRECT THE SECRETARY OF THE INTERIOR AND THE SECRETARY OF THE NAVY TO TAKE ACTION WITH RESPECT TO CERTAIN LEASES ISSUED PURSUANT TO THE OUTER CONTINENTAL SHELF LANDS ACT.

House Bill No. 7500, 93rd Cong, 1st Sess (May 3, 1973). 6 p.

Descriptors: *United States, *Legislation, *Leases, *Condemnation, Energy, Legal aspects, Contracts, Water law, Water policy, Administration, Oil, Financing, Costs, Allotments, Federal government, Continental shelf.
Identifiers: Coastal zone management, Outer Continental Shelf Lands Act.

This bill terminates all leases and rights thereunder in the Santa Barbara Channel offshore of California issued pursuant to the Outer Continental Shelf Lands Act. The holder of any terminated lease may bring an action against the United States to secure compensation for the lease so terminated. The petroleum reserve account is created, and all payments in accordance with this act shall be made from that account. Funds for the account are to come from the sale of the United States share of the oil and gas extracted from Naval Petroleum Reserve Numbered 1. A national energy reserve is created on the Outer Continental Shelf in the Santa Barbara Channel, under the jurisdiction of the Secretary of the Interior. (Glickman-Florida)
W73-13869

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT IN ORDER TO REQUIRE THE APPROVAL OF ADJACENT COASTAL STATES PRIOR TO THE CONSTRUCTION OF CERTAIN OFFSHORE FACILITIES.

Senate Bill No. 180, 92d Cong, 1st Sess, (January 4, 1973). 2 p.

Descriptors: *United States, *Coasts, *Federal Water Pollution Control Act, *Legislation, *Governmental interrelations, Construction, Governors, State governments, Oceans, Pollution abatement, Environmental effects, International waters.
Identifiers: Coastal waters.

S.180 would amend the Federal Water Pollution Control Act in order to require the approval of adjacent coastal states prior to the construction of certain offshore facilities. The bill requires that consideration be given to the environmental effects of construction beyond the territorial sea off the coast of the U.S., of ship docking, electric generating and other facilities. Since adjacent states may be adversely affected by pollution from such facilities, approval of any states which may be so affected is required before any such facilities are constructed. Reports are to be filed with the Environmental Protection Agency with respect to such facilities. The reports are to be forwarded to the Governors of the states concerned which might be adversely affected by pollution or related consequences of such facilities. If any governor fails to file approval or disapproval of the proposal within 90 days of receipt of sail report such inaction will be considered approval. (Napolitano-Florida)
W73-13870

A BILL TO PROHIBIT DISCHARGE INTO ANY NAVIGABLE WATERS OF ANY MILITARY WITHOUT CERTIFICATION BY THE ENVIRONMENTAL PROTECTION AGENCY.

House Bill 2494, 93rd Cong, 1st Sess (1973). 2 p.

Descriptors: *Legislation, *International waters, *United States, *Waste disposal, Military aspects, Biological warfare, Chemical warfare, Radioactive waste disposal, Chemical wastes, Water pollution sources, Chemicals, Legal aspects, Permits.

H.R. 2494 would prohibit any person from discharging, into any of the navigable waters of the United States or into international waters any munition, or any chemical, biological or radiological warfare agent, or any other military material, or any other refuse matter of any kind or description except in accordance with a certificate issued by the Environmental Protection Agency. (Reed-Florida)
W73-13871

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.
Senate Bill 836, 93d Cong, 1st Sess (1973). 3 p.

Descriptors: *United States, *Federal Water Pollution Act, *Legislation, *Governmental interrelations, Construction, Governors, Administrative agencies, State governments, Oceans, Pollution abatement, Oil pollution, Water pollution control.
Identifiers: Territorial waters.

S.836 would amend the Federal Water Pollution Control Act in order to require approval by Congress and by adjacent coastal states prior to construction of offshore facilities. Congress found that certain facilities being considered for construction offshore such as deep draft oil docking, electric generating plants and oil drilling facilities have a potential for creating massive pollution problems for adjacent coastal states. No federal agency is to construct or approve construction of any facility of any kind in the territorial waters off the coast of the U.S. until (1) such agency files a complete report with respect to the proposed facility with the Environmental Protection Agency; (2) the Administrator forwards the report, with his own comments to the House and the Senate and to the Governor of each adjacent coastal state concerned; (3) Congress enacts a law approval. If no notice is filed within 90 days of receipt of report, approval is assumed. (Napolitano-Florida)
W73-13872

PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS--PROPOSED GUIDELINES, PART II.
Council on Environmental Quality, Washington, D.C.

Federal Register, Vol 38, No 84, p 10856-10866, May 2, 1973. 3 append.

Descriptors: Planning, *Projects, Evaluation, *Environmental effects, Reviews.
Identifiers: *Environmental impact statements, *Environmental guidelines.

Included in the proposed guidelines for the preparation of environmental impact statements are procedures for revision and modification of present guidelines relative to which actions require statements, information required in their preparation, officials responsible, who may be consulted in their preparation and what information is to be made public. Also included are guidelines as to what constitutes a major action significantly affecting the human environment, the procedures to be followed in the actual preparation of draft statements and hearings thereon, the content of statements, the agencies that are to review the statements, the preparation and circulation of the final statements, and their final distribution. (Wadley-Florida)
W73-13873

A BILL TO BE ENTITLED AN ACT DEFINING AND RELATING TO THE MANAGEMENT AND PROTECTION OF INLAND AND COASTAL WETLANDS.

Fla. House Bill No 1789 (Feb. 1973).

Descriptors: *Florida, *Legislation, *Land management, *Wetlands, Recreation, Erosion control, Absorption, Navigable waters, Ecosystems, Aquatic life, Coasts, Intertidal areas, Land use, Zoning, Estuaries, Land development, Conservation.
Identifiers: *Coastal zone management.

This bill defines coastal and inland wetlands and provides for their management and protection. It authorizes an administration commission to designate inland and coastal wetlands as areas of critical state concern and sets forth guidelines to aid in the designation of such critical areas. Once a wetland area is designated as an area of critical state concern, development shall only be done in accord with Section 380.05 Florida Statutes. The bill provides for interim controls on development,

that is,the carrying out of any building or mining, or the making of any material change in the use or appearance of the area, for a period of one year or until the local government passes equitable regulations for the guidance of development. A severability clause and an effective date are included. (Napolitano-Florida)
W73-13874

UNITED STATES V. KENNEBEC LOG DRIVING COMPANY (LOG DRIVING ON NAVIGABLE RIVER PERMITTED UNDER THE RIVERS AND HARBORS ACT).

356 F. Supp. 344-353 (D. Maine, S.D. 1973). 10 p.

Descriptors: *Lumbering, *United States, *Navigable waters, *Rivers and Harbors Act, Legal aspects, Judicial decisions, Legislation, Pulp and Paper industry, Navigable rivers.
Identifiers: *Navigation obstructions, Injunctive relief.

The United States, under the Rivers and Harbors Act of 1899, sought to enjoin the defendant companies from engaging in log driving on a navigable river. The government alleged that the log driving obstructed navigation on the river and that the settling on the bottom of water soaked logs and bark was, in the absence of a permit from the Secretary of the Army, and unlawful deposit of refuse matter. The defendant's position was that the Act did not prohibit their operation since section 410 of the Act provided essentially that the prohibition against the floating of timber does not apply in waterways where such floating of loose timber and logs is the principal method of navigation. The court reviewed the legislative history of the Act and found that section 410 had been specifically added to allow the continuance of operation such as those in question. As to the sloughage of bark and logs, the court found that since Congress had authorized the continuance of log driving, it would be folly to suggest that Congress had meant to avoid the inherent side effects accompanying such operations. Thus, summary judgment was entered for the defendants. (McKnight-Florida)
W73-13875

UNITED STATES EX REL. SCOTT V. UNITED STATES STEEL CORP. (ACTION TO RESTRAIN STEEL COMPANY FROM DISCHARGING WASTE WATER INTO LAKE MICHIGAN).

356 F. Supp. 556-560 (N.D. Ill., E.D. 1973).

Descriptors: *United States, *Common law, *Federal Water Pollution Control Act, *Pollution abatement, *Rivers and Harbors Act, Illinois, Federal government, Legislation, Governmental interrelations, Navigable waters, Lake Michigan, State governments, Waste water (Pollution), Industrial wastes, Permits, State jurisdiction, Federal jurisdiction, Waste water disposal.
Identifiers: *Injunctive relief, Nuisance (Legal aspects), Standing (Legal).

Plaintiffs Illinois state and federal governments filed a complaint to restrain defendant steel producer from discharging waste water into Lake Michigan. Both governments sought to abate a federal common law nuisance. The United States also alleged a violation of the Refuse Act. Defendant contended the 1972 amendments to the Federal Water Pollution Control Act had precluded common law jurisdiction and superseded the Refuse Act and that a Refuse Act permit to dump waste in non-navigable waters could not be secured as this was ultra vires for the Corps of Engineers. The U.S. District court held that a state can enforce federal common law, the United States has standing to abate a common law nuisance, and the amended Federal Water Pollution Control Act doesn't abolish the common law of nuisance nor supersede the Refuse Act. Also the court held that since the ultra vires permit ruling was being appealed it wasn't ripe for use as an affirmative defense. A pendant state claim which sought to abate a common law nuisance under state law was dismissed by the court. (Wehby-Florida)
W73-13876

STATE V. ST. REGIS PAPER COMPANY (ADMINISTRATIVE HEARING NOT CONDITION PRECEDENT TO SUIT BY STATE FOR WATER POLLUTION DAMAGES).

275 So. 2d 21-23 (D.C.A. Fla. 1973).

Descriptors: *Florida, *Adjudication procedure, *Pollution abatement, *Damages, Water pollution, Legal aspects, State governments, Judicial decisions, Oil spills, Oil pollution, Water pollution control, Remedies, Legal review, Legislation, Administrative agencies.

Plaintiff, State Department of Pollution Control, sought compensation for damages to a river caused by defendant paper company's oil spillage. The circuit court dismissed the complaint holding that the plaintiff must first conduct an administrative hearing. On appeal, the Florida District Court of Appeals, First District, reversed, holding that Florida Statutes section 403.141 authorizes the Department of Pollution control to institute forthwith and without prior administrative proceeding a civil action to recover damages caused by an unlawful and negligent discharge of contaminants into the waters of the state. (Napolitano-Florida)
W73-13877

U.S. V. AMERICAN CYANAMID COMPANY (CRIMINAL PROSECUTION FOR WASTE DISCHARGES IN VIOLATION OF THE REFUSE ACT).
354 F. Supp. 1202-1205 (S.D.N.Y. 1973).

Descriptors: *United States, *Rivers and Harbors Act, *Judicial decisions, *Industrial wastes, Law enforcement, Water pollution sources, Waste disposal, Wastes, Environmental sanitation, Public health, Navigation, Permits, Tidal waters, Navigable waters, Penalties (Legal).
Identifiers: *Refuse Act, Navigability tests, Scienter, Criminal law.

The United States brought this criminal prosecution against the defendant chemical company for discharging industrial wastes into a tributary of a navigable water in violation of the Refuse Act of 1899, or section 13 of the Rivers and Harbors Act. Defendant contended the statute was only applicable to the discharges tending to obstruct navigation, that the receiving stream was not navigable, that scienter was lacking and that the absence of a waste discharge permit program under the Act precluded this criminal prosecution. The U.S. District Court held that obstruction to navigation is not an essential element for violation of the Refuse Act, scienter is not required, the receiving stream was a tributary of a navigable water and thus protected by the Act and that the nonexistence of a discharge permit program was irrelevant with respect to defendant's prosecution where the discharges were accidental and no permit would have been sought in any event. Defendant was judged guilty. (Mockler-Florida)
W73-13878

ASKEW V. AMERICAN WATERWAYS OPERATORS, INC. (CONSTITUTIONALITY OF FLORIDA'S OIL-SPILL PREVENTION AND POLLUTION CONTROL ACT).

93 S. Ct. 1590-1601 (1973).

Descriptors: *United States, *State jurisdiction, *Judicial decisions, *Legislation, *Oil spills, Florida, Legal review, Oil pollution, Constitutional law, Penalties (Legal), Disasters, Water pollution sources, Water pollution control, Federal jurisdiction, Damages, Governmental interrelations.
Identifiers: *Water Quality Improvement Act of 1970, *Florida Oil-Spill Prevention and Pollution Control Act, Absolute liability.

Plaintiffs, merchant shippers, members of the Florida coastal barge and towing industry, and owners and operators of oil terminal facilities had obtained an injunction enjoining defendants, state officials, from enforcing the Florida Oil-Spill Protection and Pollution Control Act on the ground that it was an unconstitutional intrusion into the federal maritime domain as Congress had, prior to the Florida Act, enacted the Water Quality Improvement Act of 1970. The U.S. Supreme Court, in finding for the defendant, upheld the Florida Act, which provided for the state's recovery of clean-up costs and imposed strict, no-fault liability on waterfront oil-handling facilities and ships destined for or leaving such facilities for any oil-spill damage to the state or private persons. The Court held that the Florida Act did not invade a regulatory area preempted by the federal act, which was concerned solely with the recovery of actual cleanup costs to the federal government and which presupposed a coordinated federal-state effort to deal with coastal oil pollution. (Reed-Florida)
W73-13879

JEFFERSON NATIONAL BANK AT SUNNY ISLES V. METROPOLITAN DADE COUNTY (OWNERSHIP OF FILL PLACED BEYOND BULKHEAD LINE).

271 So. 2d 207 (Fla. App. Ct. 1972).

Descriptors: *Florida, *Bays, *Riparian rights, *Navigable waters, *Bulkhead line, Legal aspects, Water law, Water rights, Water policy, Legislation, Judicial decisions, Local governments, Artificial watercourses, Permits.
Identifiers: *Fill permits.

Appellant riparian landowner extended his property into a bay by means of filling, beyond an officially established bulkhead line, without permit, and free of state or county control. Appellant sought a declaratory judgment against appellee County declaring him to be owner of the filled land. Appellee averred that the appellant's extension of property into the bay was precluded by a 1951 decree which fixed the bulkhead line, beyond which the riparian owner could not fill without a permit. In addition, a state statute which made no distinction between natural or artificially created navigable waters directed that before such a land extension could be made, a permit had to be obtained from the County. The court held that this statute took precedence over a statute which indicated that if the bay was artificially created, a riparian owner could extend his land into the bay by filling, without a bulkhead line having been fixed by the County. In addition, since a bulkhead line had been fixed, the upland owners were precluded from extending their lots by fill beyond that point. Also, the county commission could order appellant to remove the fill. (Glickman-Florida)
W73-13880

UNITED STATES V. ROHM AND HAAS COMPANY (ACTION TO ENJOIN INDUSTRIAL DISCHARGE INTO HOUSTON CHANNEL UNDER THE REFUSE ACT).

353 F. Supp. 993-996 (S.D. Tex. 1973).

Descriptors: *United States, *Rivers and Harbors Act, *Federal Water Pollution Control Act, *Industrial wastes, *Remedies, *Water quality standards, Legislation, Navigable waters, Effluents, Wastes, Water pollution sources, Liquid wastes, Waste water (Pollution), Water pollution, Water quality control, Judicial decisions, Law enforcement, Permits.
Identifiers: *Refuse Act, Effluent limitations.

Plaintiff United States sought to enjoin the defendant corporation from discharging refuse materials into the Houston Ship Channel in violation of the Refuse Act. Defendant contended that it was immune from suit under the Federal Water Pollution Control Act of 1972 since it had applied for a waste discharge permit. The U.S. District Court held that the Federal Water Pollution Act did not bar the suit. The court concluded that the Houston Ship Channel was a navigable water within the meaning of the Refuse Act, and that defendant was in violation of that act by daily discharging effluent wastes into the channel. The court enjoined defendant from further discharge in excess of prescribed daily amounts determined from expert testimony elicited during the course of the trial. The court also enjoined defendant from increasing the amount of waste materials disposed of by deep well injection. (Glickman-Florida)
W73-13881

UNITED STATES V. CONSOLIDATION COAL COMPANY (INJUNCTION TO STOP DEFENDANT'S DISCHARGE OF WASTES INTO NAVIGABLE WATERS UNDER THE REFUSE ACT).

354 F. Supp. 173-179 (N.D. W.Va. 1973).

Descriptors: *United States, *Rivers and Harbors Act, *Federal Water Pollution Control Act, *Legislation, Water pollution control, Navigable waters, Effluents, Wastes, Water pollution sources, Industrial wastes, Navigable rivers, Judicial decisions, Remedies, Waste disposal, Permits, Law enforcement, Penalties (Legal).
Identifiers: *Refuse Act, Injunctive relief.

The United States sought a permanent injunction against defendant coal company's discharge of effluent wastes into a tributary of a navigable water. The U.S. alleged that defendant discharged refuse in violation of section 13 of the Rivers and Harbors Act, the Refuse Act of 1899. Defendant answered that the Refuse Act was a navigation and not a pollution statute, and thus was not intended to control the discharge of industrial wastes. Defendant further maintained that since it had applied for a waste discharge permit, it couldn't be sued while the application was pending. The court rejected the defendant's contention and held that the Refuse Act extended to any discharge of any refuse matter regardless of its effect on navigation. It further held that injunctive relief was an appropriate remedy for enforcement of the Refuse Act, and that even though defendant had applied for a waste discharge permit, it was not immune from suit since the prosecution was initiated before the exception for pending permit applications was enacted in the Federal Water Pollution Control Act of 1972. The court therefore overruled defendant's motion to dismiss. (Glickman-Florida)
W73-13882

CONSERVANCY DISTRICTS FURNISHING WATER SUPPLY.

Ind. Ann. Stat. secs. 27-1601 thru 27-1621 (1970).

Descriptors: *Water supply, *Legislation, *Indiana, *Public utilities, Administration, Legal aspects, Water resources development, Governmental interrelations, Jurisdiction, Water rates, Government finance, Water districts, Water distribution (Applied), Water utilization.

An order of the court establishing a conservancy district or an order of the court adding the purpose of furnishing water for domestic, industrial and public use shall be deemed to grant to the conservancy district territorial authority to render the service of water supply conterminous with the boundaries of the conservancy district. Its authority shall include the power to acquire, maintain, and operate a source of water outside the boundaries of the district when permission to do so is granted by the Indiana Public Service Commission. The statutes also provide that in the event a conservancy district is established for the purpose of furnishing water supply for domestic, industrial and public use, or such purpose is added to a conservancy district and there is within the boundaries of such conservancy district a municipality or public utility providing water supply to part of the territory, the order of the court shall be deemed authority only for that territory within the boundaries not served by the municipality or public utility. (Mockler-Florida)
W73-13883

RESERVOIR SITES FOR STORAGE OF WATER.
Ind. Ann. Stat. secs. 27-1901 thru 27-1917. (1970).

Descriptors: *Indiana, *Legislation, *Reservoir operation, *Eminent domain, *Water storage, Water demand, Water management (Applied), Water supply, Reservoir storage, Usable storage, Flood control, Condemnation, Easements, Reservoirs.

The Indiana flood control and water resources commission is granted the authority to purchase or condemn easements or fee simple interests in land necessary for reservoirs for storage of water. The commission is further authorized to construct and otherwise develop necessary structures for impoundment of water on such sites. The owner of the land from which such an easement is taken, or from which the remainder interest in fee simple is taken, shall have the right to use and enjoy the land in any way consistent with the rights of the holder of the easement of remainder interest in fee simple. The owner may use the land for agricultural, recreational, or other purposes, but any such use shall be subject to the dominant purpose of storage of water. The statutes also provide that the Reservoir Coordinating Committee shall coordinate the planning and development of reservoirs for the purposes of flood control, water supply, water quality control, recreation, and related water resources purposes. (Mockler-Florida)
W73-13884

JURISDICTION OVER VARIOUS DRAINS AND EXEMPTIONS.
Ind. Ann. Stat. secs. 27-2201 (1970).

Descriptors: *Legislation, *Indiana, *Drains, *Drainage districts, Drainage systems, Water policy, Water control, Flow control, Water sources, Water reuse, Local governments, Flood control.

The statutes provide that each legal drain in a county in Indiana shall be under the jurisdiction of the board and subject to the provisions of this act. However, the construction and maintenance of that part of a legal drain located within a conservancy district which has been designated for construction or maintenance in the final plan of the district, and which plan has been approved by the court before the effective date of the act shall not be subject to the provisions of the act. In addition whenever a legal drain which is subject to the provisions of the act is included in a flood control project which has been approved by the department of natural resources, such drain shall cease to be subject to the provisions of the act and the responsibility for reconstructing or maintaining such drain shall be the responsibility of the local agency responsible for constructing or maintaining the approved flood control project. Private and mutual drains are not subject to this act unless the owners of land affected request otherwise. However, lands drained by a private or mutual drain may be subject to assessment for improvements made to a legal drain if such lands are also drained by the legal drain. (Mockler-Florida)
W73-13885

RIGHTS OF WAY—OBSTRUCTIONS—CROSSINGS—CONNECTIONS.
Ind. Ann. Stat. secs. 27-2301 thru 27-2310 (1970).

Descriptors: *Indiana, *Legislation, *Obstruction to flow, *Drainage, *Drains, Water control, Outlets, Drainage systems, Controlled drainage, Water management (Applied), Drainage programs, Flow control, Easements, Right-of-way.

These statutes cover rights-of-way on private lands and the restrictions on their use, obstruction of drains by the owners of the lands, public utilities, pipeline compaines, construction of drains near levees, drains crossing public highways, construction of drains which deprive owners of ingress or egress to tracts of land, and inadequate private crossings. The statutes set out specific requirements governing the connection of private drains with legal drains, the construction or extension of private or mutual drains, and the reconstruction of drains made inadequate by a change of land use. The statutes specifically provide that if any obstruction or damage has been caused by an owner of land affected by the drain, the board may, after a hearing brought on by written notice served on the owner, add an amount sufficient to pay for such damage to the next annual assessment made against the lands of such owner. (Mockler-Florida)
W73-13886

CLAFLIN V. STATE DEPARTMENT OF NATURAL RESOURCES (REVIEW OF DENIAL BY DEPARTMENT OF NATURAL RESOURCES OF AN APPLICATION FOR PERMIT FOR STRUCTURE IN LAKE).
206 N.W. 392-298 (Wis. 1973).

Descriptors: *Water rights, *Judicial decisions, *Wisconsin, *Legal aspects, Environmental effects, Navigation, Permits.

An application for a permit to construct a boathouse on a lake was denied by the Wisconsin Department of Natural Resources (Department) and an appeal was taken. On appeal it was held improper for the Department to apply a rule relative to such boathouses that was adopted after the hearings on the permit application but prior to final disposition of the issue by the Department. The case was remanded by the court for a new determination on whether to issue the permit based on whether this particular boathouse, in this precise situation, is detrimental to the public interest. Such a determination may give weight to such factors as the effect the boathouse will have on natural beauty, on navigability or on the effective flood flow. (Wadley-Florida)
W73-13887

RIVER REGULATION BY STORAGE RESERVOIRS.
New York Sess. Laws, Ch. 664, Secs. 15-2101 thru 15-2141 (McKinney 1973).

Descriptors: *New York, *Legal aspects, Reservoirs, *Reservoir storage, Impoundments, *River regulation.
Identifiers: Legislation.

River regulations districts are created to supervise the construction, operation and maintenance of reservoirs for the purpose of regulating the flow of streams when such is required by the public health, safety and welfare. The powers and duties

uch districts are specified and procedures for
struction of reservoirs are included. Other
visions deal with financing, operation of the
rvoirs, hearings, reports, operation and main-
ance, charges, cost apportionment and taxa-
. (Wadley-Florida)
3-13888

RAHM V. DIAMOND (REVIEW OF GRANT CERTIFICATE FOR CONSTRUCTION OF A DROELECTRIC PLANT).

N.Y.S.2d 84-98 (N.Y. 1973). 15 p.

criptors: *New York, *Hydroelectric project
nsing, *Water quality standards, *Administra-
decisions, Administrative agencies, Govern-
ital interrelations, Judicial decisions, Saline
er intrusion, Thermal pollution, Environmental
ects, Legal review, Hydroelectric plants, Hud-
river, State jurisdiction, Federal Water Pollu-
Control Act, Permits.
ntifiers: Administrative regulation.

intiffs conservation groups sought review of
issuance by the Environmental Conservation
nmissioner of a certificate that the proposed
struction of a pumped storage hydroelectric
ility on the Hudson River would not violate ap-
able water quality standards. Plaintiffs charged
t the Commissioner had acted arbitrarily and
riciously in certifying that the project would
violate water quality standards and also that he
failed to consider several relevant matters in
king his determination. The court recognized
t the Federal Water Pollution Control Act
nquished to the states only a narrow authority
determine whether there is reasonable as-
ance that the water quality standards of the
e are not violated and that the states were not
en authority to consider matters within the ju-
diction of the Federal Power Commission. The
rt therefore found that the Commissioner had
rectly considered all relevant factors within his
sdiction and that his decision was reasonable.
e court reviewed the Commissioner's specific
ding as to the effect on fish life, saltwater intru-
n, and possible thermal pollution and concluded
t all were supported by the facts. (McKnight-
rida)
3-13889

ISAFULLI V. STATE (SUIT FOR FLOOD MAGES ALLEGEDLY CAUSED BY STATE'S ILURE TO OPEN FLOODGATES).

N.Y.S.2d 138-140 (App. Div., 4th Dep't. 1973).

scriptors: *New York, *Flood damage, *Flood
ntrol, *Water management (Applied), Legal
ects, Judicial decisions, Drainage engineering,
ainage programs, Floodgates, Damages,
ainage patterns (Geologic), Surface drainage.

intiffs, owners of muck farms, brought suit
inst the state of New York for damages due to
oding. The plaintiffs alleged that they were
naged by waters backing up in a creek which
ined their lands due to the failure of the state to
en flood gates downstream. The state presented
dence showing that the plaintiffs' land was
ht feet higher than the river water at the flood
es and this was unrebutted by the plaintiffs.
e appellate court thus found that since water
m the river could not flow uphill to reach the
intiff's land, the trial court's verdict for the
intiffs was against the weight of the evidence.
e appellate court therefore reversed the
dgment and ordered a new trial. (McKnight-
rida)
73-13890

WATER POLLUTION CONTROL.
N.Y. Sess. Laws, Ch. 664, Secs. 17-0101 through 17-0303 (McKinney 1973).

Descriptors: *New York, Legislation, Water quality, *Regulation, Legal aspects, *Water pollution control, *Permits, Sewage treatment, Waste treatment.
Identifiers: Marine toilet.

It is the public policy of the State of New York to maintain reasonable standards of water purity consistent with public health and public enjoyment of the waters of the state, to protect fish and wildlife, and to promote the industrial development of the state. This legislation is designed to prevent new water pollution and to abate existing pollution under a program consistent with the stated policy. The powers of the New York State Health Department, relative to carrying out the stated policy are detailed. Also included are provisions dealing with permits, certificates, procedures, marine toilet pollution control devices and standards, realty subdivisions, sewerage service and discharge of sewage into waters. (Wadley-Florida)
W73-13891

SOUTH COUNTY DRAINAGE DISTRICT V. BREVARD COUNTY (APPEAL BY DRAINAGE DISTRICT FROM JUDGMENT DENYING DISTRICT'S PRAYER FOR PERMISSION TO AMEND ITS PLAN OF RECLAMATION).

277 So. 2d 31-34 (1st D.C.A. Fla. 1973). 4 p.

Descriptors: *Florida, *Legal aspects, Judicial decisions, Drainage, Water management (Applied), *Drainage districts.

On appeal from an adverse decision of the circuit court, the District Court of Appeals held that the failure of the drainage district to publish in the appropriate county a notice of drainage hearings to be held on the district's petition to extend its boundaries into that county invalidated that part of the district's order purporting to so extend the boundary lines even though the proposed extension was made of the request of and with the consent of the only affected landowner in that county whose property would be included. (Wadley-Florida)
W73-13892

ORANGE COUNTY AUDUBON SOCIETY, INC. V. HOLD (STANDING OF CONSERVATION GROUP TO SUE AS CITIZEN).
276 So. 2d 542-544 (Fla. D.C.A. 1973). 3 p.

Descriptors: *Florida, *Remedies, *Regulation, *Jurisdiction, *Legislation, Judicial decisions, Water law.

An incorporated conservation organization brought an action against the Board of County Commissioners to compel enforcement of environmental laws. The circuit court dismissed for lack of standing to maintain the action. On appeal, it was held that the term 'citizen' in an act making the protection of the environment a collective responsibility and providing a procedure whereby governmental bodies could be compelled to enforce applicable laws included artificial persons as well as natural persons. Since corporations are artificial persons, they have standing to sue. (Wadley-Florida)
W73-13893

ROBERTS V. BREWER (BILL IN EQUITY TO ABATE ALLEGED NUISANCE).
276 So. 2d 574-583 (Ala. 1973). 10 p.

Descriptors: *Alabama, *Judicial decisions, *Legal aspects, *Water law, Dams, Water rights, Flood control.

Plaintiff brought an action to abate an alleged nuisance in the nature of Beaver dams. The dams backed water onto plaintiff's property and destroyed trees. Most of the water backed up by the primary dam was on land of a third party, not a party in the suit. It was held that a third party cannot be deemed to acquire an interest in the maintenance of a nuisance injurious to another merely because abatement of the nuisance might affect in some way the property of such third party. As the complainant was a riparian on the dammed stream and had the right thereby to have the water flow by without obstruction or alteration, including at its natural level, any obstruction that results in unnatural enlargement gives the upper proprietor a right of action. Although defendant had no legal liability to remove the dam, it was held that complainants be allowed to enter the land and remove the dam themselves. (Wadley-Florida)
W73-13894

STATE, DEPARTMENT OF CONSERVATION V. SHERIFF (APPEAL FROM JUDGMENT ENJOINING DEFENDANT FROM PLACING FILL IN A LAKE BED).
207 N.W.2d 358-360 (Minn. 1973). 3 p.

Descriptors: *Minnesota, *Judicial decisions, *Legal aspects, *Landfills, Legislation, High water mark.
Identifiers: Fill permits.

In 1962, application was made for permit to place fill upon lake bed below established high water mark. No appeal was taken at that time from denial of the permit. Eight years later, defendant was discovered dumping fill into the lake, and the state obtained an order enjoining and restraining defendant from depositing fill. On motion for summary judgment, defendant was ordered to remove fill previously placed and permanently enjoined from depositing more fill below ordinary high water mark. On appeal, the court held that defendant's proper course of action to contest state allegation that such fill was detrimental to public interest or benefit was to appeal from the 1962 denial of permit application. Since no such appeal was taken defendant is not entitled to a redetermination of that issue. To order defendant to remove all fill held too broad and court ordered only that fill deposited after 1962 be removed. (Wadley-Florida)
W73-13895

CITY OF MATTOON V. ILLINOIS ENVIRONMENTAL PRO. AGCY. (PETITION FOR REVIEW OF ORDER OF POLLUTION CONTROL BOARD).

296 N.E.2d 383-387 (Ill. Ct. App. 1973). 5 p.

Descriptors: *Illinois, *Judicial decisions, Legal aspects, Public health, Legislation, Standards, Penalties (Legal), Water pollution control.

The defendant Pollution Control Board (Board) ordered plaintiff city to submit plans and specifications for sewage facilities and to construct such facilities by a specified date. The city failed to timely submit the required plans and was fined by the Board. The court held that the action exceeded the Board's statutory authority. Holding in favor of the city, the court ruled that the Board might pursue enforcement procedures with respect to the city's variance petition seeking temporary relief from the regulation only if a grant of such power was explicit in the statute. Here none was found. Further, in this case, no complaint was ever filed upon the city as required by statute, nor were the notice provisions of the statutes complied with. (Wadley-Florida)
W73-13896

CITY OF WAUKEGAN V. ENVIRONMENTAL PROTECTION AGENCY, ETC. (APPEAL FROM ORDER OF POLLUTION CONTROL BOARD ASSESSING FINES AGAINST CITY AND CORPORATION).
296 N.E.2d 102-112 (Ill. Ct. App. 1973). 11 p.

Descriptors: *Illinois, *Judicial decisions, Legal aspects, Penalties (Legal), Water pollution control, Waste disposal.

The Illinois Pollution Control Board (Board) assessed a fine of one thousand dollars against the City of Waukegan for operating a refuse disposal site without a permit, for allowing open dumping, creating a water hazard and for failing to provide daily cover for the refuse. On appeal from the decision of the Board, the court held that such a determination by the Board constituted an unlawful delegation of judicial power to an administrative agency since the imposition of a discretionary fine (as is the case here) is clearly a judicial act. The part of the Environmental Control Act authorizing such a procedure is thereby void. (Wadley-Florida)
W73-13897

DE RAHM V. DIAMOND (SUIT TO REVIEW AGENCY'S ISSUANCE OF A CERTIFICATE OF 'REASONABLE ASSURANCE' THAT PROPOSED CONSTRUCTION OF FACILITIES ON A RIVER WILL NOT VIOLATE WATER QUALITY STANDARDS).
295 N.E.2d 763-773 (N.Y. 1973). 11 p.

Descriptors: *New York, *Legal aspects, *Water quality control, Pollution abatement, Water pollution control, *Water quality standards.

As required by applicable federal law, Consolidated Edison applied for and received a certificate of reasonable assurance that New York state water quality standards would not be violated by the proposed project. Conservation groups appealed for a review of the certificate and the Supreme Court set aside the determination. On appeal of that decision to the Court of Appeals, it was held that the record established that the commissioner gave due consideration to every factor which had a bearing on the applicable water quality standards and the determination was therefore rational and reasonable. Specifically, factors included the possibility of thermal pollution, salt water intrusion, danger to fish life, and possible pollution discharges into the aqueduct. (Wadley-Florida)
W73-13898

MOLOKAI HOMESTEADERS COOPERATIVE ASS'N. V. MORTON (ACTION FOR PRELIMINARY INJUNCTION TO PREVENT BOARD OF LAND AND NATURAL RESOURCES FROM ENTERING INTO AGREEMENT WITH CORPORATION FOR USE OF PIPELINE).
356 F. Supp. 148-153 (D. Hawaii 1973). 6 p.

Descriptors: *Hawaii, Legal aspects, Judicial decisions, *Irrigation districts, Irrigation systems, Pipelines.
Identifiers: *Environmental impact statements.

The court denied an application for a preliminary injunction to prevent the Hawaii Board of Land and Natural Resources from entering into an agreement with private corporations to use the pipeline and facilities of the Molokai irrigation system. The reason for the denial was that plaintiffs failed to show irreparable injury from the proposed action. In so holding, the court concluded, among other things, that since the action proposed is not federal in nature, relevant provisions of the National Environmental Policy Act requiring an impact statement were not applicable. (Wadley-Florida)
W73-13899

WATER MANAGEMENT--BASIC ISSUES.
Organization for Economic Co-Operation and Development, Paris (France).

1972. 546 p.

Descriptors: *Water management (Applied), *International commissions, *Water resources development, *Conferences, Documentation, Economics, Legal aspects, Administration, Planning, Environment, Technology, Ecology, United States, Canada, Europe, Water quality control.
Identifiers: Japan.

The Water Management Research Group, now renamed the Water Management Sector Group under the Environment Committee of the Organization for Economic Cooperation and Development (OECD), was established in 1967 and has held a series of meetings. This report contains the papers presented at the North American meetings of the Group, July 15-24, 1970. The papers discuss water management problems related to environment in Canada and the United States from scientific, technological, administrative, legal, and economic viewpoints; and provide comparisons with methods used in other member countries. The papers are grouped in five parts: part I, North American water policies and programs; part II, basin and regional programs in North America, part III, water resources research in North America; part IV, joint United States-Canadian programs; and part V, illustrations of European and Japanese approaches to solving basic problems in water management. The papers are published in the original language of submission. (See W73-13917 thru W73-13959) (Woodard-USGS)
W73-13916

STATEMENT,
Department of the Interior, Washington, D.C.
W. J. Hickel.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 21-22, 1972.

Descriptors: *Water management (Applied), *Water resources development, *Conferences, *Water policy, Social aspects, Recreation, Water demand, United States, Planning, Economic aspects, Water pollution control, Ecology, Water supply, Water quality control.

The subjects and case studies presented are of mutual concern to all mankind: water resources of the world are limited and need to be carefully managed. Based on a recent national assessment of water resources prepared by the Water Resources Council, the United States realizes that there is still much to learn in order to manage this vital resource to its best advantage. (See also W73-13916) (Knapp-USGS)
W73-13917

STATEMENT,
Organization for Economic Co-Operation and Development, Paris (France).
G. Eldin.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 25-26, 1972.

Descriptors: *Water management (Applied), *Water resources development, *Conferences, *Water policy, Social aspects, Recreation, Water demand, United States, Planning, Economic aspects, Water pollution control, Ecology, Water supply, Water quality control.

The objectives of the Organization for Economic Development (OECD) Water Management Research Group meeting held in North America, the results of which are described in this report, were to examine water-management problems in relation to the environment in the United States and Canada, and to compare the methods used in these countries with those adopted in other OECD countries. In directives issued in May 1970, the OECD Council of Ministers considerably broadened the scope of this work and set it along a new course. On that occasion, Ministers, upon fixing quantitative growth targets during the decade 1970 to 1980 for OECD countries as a whole, stressed the importance of the qualitative aspect of economic growth and more especially the great value of preserving and improving environmental quality. They recommended that the Organization so extend its environmental work as to assess the economic and trade implications of environmental policies, relate these activities to the broader objectives of economic and social development and suggest concerted solutions to problems with substantial international implications. (See also W73-13916) (Knapp-USGS)
W73-13918

UNITED STATES WATER POLICY,
Department of the Interior, Washington, D.C.
J. R. Smith.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 41-46, 1972.

Descriptors: *Water management (Applied), *Water policy, *United States, *Water resources development, Planning, Social aspects, Economic aspects, Water quality control, Pollution abatement, Ecology, Water supply, Water utilization, Reviews, Evaluation, Federal Government, Recreation.

The objectives of planning for the use and management of water and related land resources should be on a broader basis than just increasing the output of goods and services. Studies are now under way to provide for multiple objective approach. Under this proposal, the objectives would be not only the national economic development but would include on an equal basis enhancement of the environment by conservation, preservation, creation, restoration, or improvement of the quality of natural, scenic, biological, geological, and cultural resources; enhancement of the social well-being of persons, groups, and communities, including the geographic distribution of population and employment in relation to national goals and the attainment of an urban-rural balance; and recognition of regional aspects of water resources development, including evaluation of enhancement of regional development through increases in income and employment, and improvement of its economic base, environment, and social well-being. (See also W73-13916) (Knapp-USGS)
W73-13919

RECENT DEVELOPMENTS IN WATER MANAGEMENT POLICY OF THE UNITED STATES GOVERNMENT,
Water Resources Council, Washington, D.C.
W. D. Maughan.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 47-55, 1972. 2 fig, 1 tab.

Descriptors: *Legislation, *Water Quality Act, *Water resources planning act, *Water Resources Research Act, *Water resources development, Planning, Water management (Applied), Water policy.
Identifiers: Environmental Impact Statements.

The existing development and use of the nation's water resources have evolved over a long period in a setting of abundant natural resources. This has been without benefit of broad planning frameworks to relate individual problems and their solutions to available resources and the regional needs. Comprehensive and coordinated planning among federal government, State and local

authorities, and private enterprise is essential if water needs of the future are to be met. The Water Resources Planning Bill was introduced into the Congress in 1961 and became an Act in 1965. The first title provides for establishment of the Water Resources Council and assigns to it responsibilities for formulating principles, standards, and procedures for use by all federal agencies, and for preparing, periodically, a national assessment of the nation's water resources. The second title of the Act provides for the establishment of river basin commissions. The third title of the Act sets up a federal grant program. The first National Assessment indicated that although the country's withdrawals of fresh and saline water will increase fivefold over the next 50 years, the consumptive use will only double. The Environmental Quality Act, which became effective on January 1, 1970, includes a requirement that all agencies of the federal government shall include in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on the environmental impact of the proposed action. (See also W73-13916) (Knapp-USGS)
W73-13920

THE ROLE OF THE UNITED STATES ARMY CORPS OF ENGINEERS IN WATER MANAGEMENT,
Corps of Engineers, Washington, D.C.
F. J. Clarke.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 57-62, 1972. 2 photo.

Descriptors: *Water management (Applied), *Water resources development, *Flood control, *Navigation, Flood plains, River training, Comprehensive planning.
Identifiers: *U.S. Army Corps of Engineers.

The United States Army's Corps of Engineers is unique among military organizations in having a major civilian public works assignment. The Army Corps of Engineers is the principal agency working with harbors, waterways, and river basins. The oldest of these missions is the provision of harbors and shallow and deep draft navigation channels in inland and coastal waterways. Virtually all United States commercial harbors have required improvement to make them useful to modern shipping. The second major traditional function is flood control. Another of the programs is the protection or restoration of beaches and shores suffering from erosion, and the protection of coastal areas from flooding due to hurricanes and tides. To support their activities the Army Engineers carry out an extensive research program at a number of installations, the largest is the Waterways Experiment Station at Vicksburg, Mississippi, where most model studies were conducted. Finally, because they have an experienced decentralized field organization in close contact with the engineering and construction resources of the entire nation, they play a major role in recovery from disasters of all kinds. (See also W73-13916) (Knapp-USGS)
W73-13921

THE ROLE OF THE UNITED STATES BUREAU OF RECLAMATION IN WATER MANAGEMENT ACTIVITIES,
Bureau of Reclamation, Washington, D.C.
E. L. Armstrong.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 63-68, 1972. 2 photo.

Descriptors: *Water resources development, *Planning, *Federal government, *Reclamation states, Federal Reclamation Law, Water reuse, Water storage, Water conservation, Comprehensive planning.
Identifiers: *Bureau of Reclamation.

The U.S. Bureau of Reclamation was created in 1902 to assist in opening up to settlement and economic growth, through development of water and related land resources, the area that now comprises the 17 western States. Through the development of irrigation with its accompanying community and regional economic growth, the reclamation program has assisted in the creation of the economic and social base that underlies the American West. Research in weather modification to augment natural water supplies has been underway since 1962. In addition to weather modification, desalinization, and undersea transport, the Bureau intends to look into opportunities for the use of geothermal steam, underground storage, recycling, renovation, reuse of water, and to explore means and methods of more efficiently utilizing available water supplies. (See also W73-13916) (Knapp-USGS)
W73-13922

PLANNING AND IMPLEMENTATION OF WATER AND RELATED LAND RESOURCE DEVELOPMENTS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE,
Soil Conservation Service, Washington, D.C.
K. E. Grant.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 69-74, 1972. 1 photo.

Descriptors: *Water resources development, *Land management, Watershed management, Planning, Conservation, Erosion control, Farms, Farm management, Comprehensive planning.
Identifiers: *Department of Agriculture.

The United States Department of Agriculture is concerned with comprehensive planning for the development of water and related land resources. Comprehensive river basin planning activities are conducted by the Soil Conservation Service, the Forest Service, and the Economic Research Service. In most river basins, especially those in the eastern two-thirds of the United States, 80% or more of the land is in agricultural use, including timber production. With much of the land used for agricultural purposes agriculture has a significant influence on river basin planning and management. The primary aims of the Soil Conservation Service are: to control soil erosion and reduce sediment pollution through proper land use by measures protecting soil and managing runoff water on farms and other lands; to protect land resources to assure their sustained productivity of agricultural commodities; to reduce floodwater and sediment damage to agricultural crops, pasture, livestock, and farm improvements, to roads and bridges, and to urban, residential, and industrial investments in upstream flood plains; to provide adequate water management on farmlands to permit production on bottom, crop, and pasture lands; to provide water supply for rural commodities in upstream areas for municipal and industrial uses, irrigation, water-based recreation, fish and wildlife enhancement, and water-quality management; to guide local communities in water-resource developments that will contribute to community development and stimulate economic growth; and to protect and enhance the environment through all conservation activities. (See also W73-13916) (Knapp-USGS)
W73-13923

CANADIAN WATER POLICY: HISTORY, PROBLEMS AND RECENT DEVELOPMENTS,
Department of Energy, Mines and Resources, Ottawa (Ontario).
J. Austin.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 77-84, 1972.

Descriptors: *Canada, *Planning, *Water management (Applied), Great Lakes, International Joint Commission, St. Lawrence River, Water pollution control, Political aspects, Comprehensive planning.

The Canada Water Act embodies concepts of an integrated approach to water management. The Act was developed also within the Canadian system of shared jurisdiction between federal and provincial governments. In Canada the actual ownership of the water resources is generally agreed to belong to the provinces. The federal government, however, has specific and major responsibilities for navigation and fisheries, and joint responsibility with the provinces for agricultural uses of water. The federal government also has general responsibilities arising from the fact that lakes and rivers often straddle interprovincial and international boundaries. With the passage of this Act, the federal government will be able, for the first time, in close cooperation with the provinces, to take initiatives to develop a comprehensive approach to water management. The growing complexity of water problems arising from new technology and rapidly increasing water use requires continuing and increasingly effective forms of international cooperation on a broad basis, for the exchange of experience or research information, for consultation, and for joint efforts to find solutions to common problems. (See also W73-13916) (Knapp-USGS)
W73-13924

CANADIAN FEDERAL WATER RESOURCE POLICY,
Department of Energy, Mines and Resources, Ottawa (Ontario).
E. R. Tinney, and R. J. Van Loon.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 85-97, 1972. 1 fig.

Descriptors: *Canada, *Water law, *Water resources development, Legislation, Water management (Applied), Water pollution control, Political aspects.

The Canada Water Act, passed by the Canadian Parliament on June 26, 1970, is an attempt to apply the most modern principles possible to water resource management in the Candian setting. In situations where the problems of pollution are paramount and urgent, the Act has special provisions for the establishment of water quality management agencies whose job it will be to control and manage all aspects of water quality in a river basin. There are four distinct kinds of institutional bodies being set up to achieve joint federal-provincial cooperation. These are consultative committees, joint planning boards with the subordinate committees, joint water quality management agencies, and joint implementation boards. (See also W73-13916) (Knapp-USGS)
W73-13925

PLANNING FOR THE PACIFIC NORTHWEST,
Pacific Northwest River Basins Commission, Vancouver, Wash.
D. J. Lane.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 101-108, 1972.

Descriptors: *Water resources development, *Planning, *Interstate commissions, Water management (Applied), River basin commissions, Comprehensive planning, River basin development.
Identifiers: *Pacific Northwest River Basins Commission.

The Pacific Northwest River Basins Commission has 15 members; one representative from each of the five member States; a representative of each of the following seven federal cabinet departments: Agriculture, Army, Commerce, Health, Education and Welfare, Housing and Urban Development, Interior, and Transportation; a representative of the Federal Power Commission; a representative of the United States-Columbia River Treaty; and a federal chairman appointed by

and serving at the pleasure of the President of the United States. The commission writes rules, approves plans of study, develops joint funding programs and monitors the progress of comprehensive water and related land planning programs within its jurisdiction. The members of the Commission represent every well-defined water interest, thus assuring a proper and vigorous presentation of each possibility for use or preservation of importance. The decision making process for the Commission is an integration of mathematics, technology, and well-informed judgment. (See also W73-13916) (Knapp-USGS)
W73-13926

PROGRAMMES OF THE TENNESSEE VALLEY AUTHORITY,
Tennessee Valley Authority, Knoxville.
A. J. Wagner.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 109-122, 1972. 2 fig.

Descriptors: *Tennessee Valley Authority, *Water resources development, Social aspects, Transportation, Water management (Applied), River basin development.

While the major components of TVA's regionwide river control system have been completed, smaller scale additions will be required for many years to come. They will be necessary in order to assure the continued growth of the economy; the TVA is convinced that it can be done without harming the environment. As a means of encouraging heavy industry which will require higher skills and pay higher wages, TVA now plans to create additional transport complexes. It does this sometimes by extending navigation by dam construction or dredging, sometimes by extending rail service to the waterway. Both the economic benefits from this type of development and also the very important social consequences must be emphasized. The creation and use of these complexes and their surrounding sites will have a tendency to disperse the industrial establishment of the region and thus diminish the social pressures which arise in congested urban areas. (See also W73-13916) (Knapp-USGS)
W73-13927

PLANNING IN THE NEW ENGLAND REGION,
New England River Basins Commission, Boston, Mass.
R. F. Gregg.

Descriptors: Planning, *Water resources development, *New England, New England Interstate WPS Compact, Water management (Applied), Interstate commissions, River basin development, River basin commissions, Comprehensive planning.

Effective management of water and related land resources of New England requires simultaneous and coordinated federal-state planning for both hydrographic and political regions, with particular reference to the development of statewide water and related land plans which serve as guides to federal as well as state management activities. The NERBC has an approach to planning which calls for the early completion for the entire region and appropriate sub areas of a comprehensive, coordinated joint plan setting forth coordinated action programs for a mid-range period of about 10-15 years. The New England framework study is adapted from the North Atlantic Regional Water Resources Study, to be completed in fiscal year 1971 under leadership of the North Atlantic Division United States Army Corps of Engineers. Reconnaissance-level water and related land management plans for each of the New England states are to be jointly formulated by teams of state, federal, and NERBC professionals under State leadership. The plans will recommend specific steps which should be taken during the next 10-15 years to conserve, protect, and develop water and related land resources of the State. Management plans are used for selected sub-regions of unusual complexity or conflict. A comprehensive plan for the Connecticut River basin, the region's largest, is virtually completed. A federal-state management plan for the southeastern New England area (covering the Massachusetts coastal area and rivers, and almost all of Rhode Island) will begin July 1, 1970. It is scheduled to be completed in fiscal year 1974. The proposed program recommends a third intensive sub-regional study, a reconnaissance-level plan for Long Island Sound, to be organized as a joint effort of the States of Connecticut and New York, federal agencies, and local governments. (See also W73-13916) (Knapp-USGS)
W73-13928

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY,
Corps of Engineers, Washington, D.C.
H. E. Schwarz.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 135-145, 1972. 3 fig.

Descriptors: *Planning, *Water resources development, *Northeast U.S., Water management (Applied), River basin development, Interstate commissions, River basin commissions, Comprehensive planning.
Identifiers: *North Atlantic Regional Water Resources Study.

Population growth and accelerated economic development are placing increasing demands on the water and related land resources of the United States. Efforts to establish machinery for coordination of diverse interests represented by a large number of federal, state, and local agencies culminated in the Water Resources Planning Act of 1965 which established the Water Resources Council. It is under the guidelines of this body that the North Atlantic Regional Water Resources Study is conducted. The NAR study is directed towards planning for the optimum development of water and related land resources over a planning period extending to year 2020, with intermediate bench-mark years set at 1980 and 2000. It is a 'framework' type of study intended to provide an overview of regional and subregional needs, an assessment of supply and demand, and should serve as a guide for future developments in the region. The study will illuminate the choices that are available to the decisionmaker and lay before him facts and opinions to aid him in his judgement. The NAR study concentrates on the broad regional aspects of water resources, and as such, the planning effort was viewed as a partnership among federal agencies, States, and regional basin commissions. (See also W73-13916) (Knapp-USGS)
W73-13929

SOME EXPERIENCES OF THE ONTARIO WATER RESOURCES COMMISSION,
Ontario Water Resources Commission, Ottawa.
D. J. Collins.
In: Water Management--Basic Issues, Organization for Economic Cooperation and Development, Paris, France, p 147-161, 1972. 2 fig.

Descriptors: *Canada, *Planning, *Water resources development, *Water pollution control, River basin development, Water management (Applied), Comprehensive planning.
Identifiers: *Ontario Water Resources Commission.

Experiences of the Ontario Water Resources Commission related to water resources surveys and to providing water and sewage works or services for municipalities are described. The authority for the Commission and its programs is The Ontario Water Resources Commission Act, as enacted in 1957 and appropriately amended. Regulations made under the Act are used to control such diverse activities as the drilling of water wells, the use of aquatic herbicides and plumbing. Water rights in the province are based on English common law with some supplementary legislative requirements governing takings of water. (See also W73-13916) (Knapp-USGS)
W73-13930

WATER RESOURCE PLANNING FOR THE SUSQUEHANNA RIVER BASIN,
Army Engineer District, Baltimore, Md
W. J. Love, and A. E. Robinson, Jr.
In: Water Management--Basic Issues, Organization for Economic Cooperation and Development, Paris, France, p 163-175, 1972.

Descriptors: *Planning, *River basin development, *Water resources development, Water management (Applied), Chesapeake Bay, Social aspects, River basin commissions, Interstate commissions, Comprehensive planning.
Identifiers: *Susquehanna River Basin.

The Susquehanna River basin is the largest on the Atlantic Seaboard of the United States, having a drainage area of approximately 27,500 sq mi. It traverses many ecological and economic settings in three states, New York, Pennsylvania, and Maryland. In 1963 the Congress of the United States requested a comprehensive study of the water and related land resources of the basin. The task of preparing the report and coordinating the study was assigned to the Baltimore District, U. S. Army Corps of Engineers. Before the Susquehanna River basin (SRB) study began, it was realized that a meaningful study must fully consider all aspects of water resource development, and that it would be necessary to ascertain the viewpoints of all interested persons. It was therefore necessary to develop methods to do this and one of the first steps taken was to form a coordinating committee. Representation of 7 federal agencies and 3 states on the committee insured that a multitude of viewpoints would be reflected in any decisions made. Through the information program, where possible, the views of the general public have been incorporated into the plan. With this information program the coordinating committee has formulated a plan for the conservation and development of the basin's resources which, hopefully, will meet the needs of the developing basin, preserve and enhance its environment, and be acceptable to the public. (See also W73-13916) (Knapp-USGS)
W73-13931

THE WORK OF THE DELAWARE RIVER BASIN COMMISSION,
Delaware River Basin Commission, Trenton, N.J.
P. M. VanWegen.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 177-188, 1972.

Descriptors: *Delaware River Basin Commission, *Planning, *Water resources development, *Water management (Applied), Delaware River, Regulation, Interstate commissions, River basin commissions, Comprehensive planning.

The Delaware River Commission is an institutional arrangement by which four States--New York, New Jersey, Delaware and Pennsylvania--and the United States Government act together to carry out responsibility for planning and managing water and related resources development in the Delaware River Basin. It is the only full partnership federal-inter-state organization in the United States vested with comprehensive planning and management responsibilities, and with full enforcement powers to insure program implementation. The Commission was established in 1961 after a long history of multi-State water supply

lisputes dating back to the 1920's, and a chronic need to provide adequate flood protection within the basin. (See also W73-13916) (Knapp-USGS)
W73-13932

A WATER SUPPLY STUDY OF THE SASKATCHEWAN-NELSON BASIN,
Saskatchewan-Nelson Basin Board, Regina.
E. F. Durrant, and G. C. Mitchell.
In: Water Management--Basic Issues Organization for Economic Cooperation and Development, Paris, France, p 189-202, 1972. 5 fig.

Descriptors: *Planning, *River basin commissions, *Canada, River basin development, Water management (Applied), Water supply, Political aspects, Administration, Comprehensive planning.
Identifiers: Sadkatchewan-Nelson basin.

On October 16, 1967, the government of Canada and the governments of Canada's three prairie provices (Alberta, Saskatchewan, and Manitoba) signed an agreement to undertake a 4-year, 5-million dollar study of the water resources of the Saskatchewan-Nelson basin including the potential additional supply by diversion or storage. This limited-purpose study represents a logical step in the evolution of interjurisdictional arrangements for integrated water resource management. The primary concentration of this study is on the Saskatchewan-Nelson as a hydrologic unit with contiguous river systems to the north being considered mainly as potential sources of additional supply. The Saskatchewan-Nelson basin is very large and complex--hydrologically, economically, and politically. The basin comprises 414,000 square miles from snowcapped mountains rising above 10,000 feet, across the agricultural prairie sloping from 3,000 to 800 feet through the bedrock and tundra of the Canadian Shield down to Hudson Bay. The climatic environment ranges from subhumid to semiarid. The basin covers portions of 4 provinces in Canada and 4 States in the United States. (See also W73-13916) (Knapp-USGS)
W73-13933

WATER RESOURCES PLANNING IN THE OKANAGAN BASIN,
Department of Energy, Mines and Resources, Ottawa (Ontario). Policy and Planning Branch.
R. C. Hodges, H. M. Hill, and R. Koop.
In: Water Management--Basic Issues Organization for Economic Cooperation and Development, Paris, France, p 203-215, 1972. 2 fig.

Descriptors: *Planning, *River basin commissions, *Canada, River basin development, Water management (Applied), Water supply, Water pollution control, Political aspects, Administration, Comprehensive planning.
Identifiers: *Okanagan basin.

In the Okanagan basin in British Columbia, Canada, an intergovernmental agreement was negotiated for the purpose of carrying out a comprehensive water resources planning program. A comprehensive planning approach to the entire Okanagan region of British Columbia is a logical step to the solution of existing problems. Such a comprehensive approach to the Okanagan basin offers an opportunity for multidisciplinary, multidimensional planning, based on studies of economic growth, water quality and quantity, management alternatives, ecology and aesthetics and public involvement. Such a comprehensive approach not only allows for the solution of existing problems, but also permits establishment of a framework plan to deal with future water resource management problems in the Okanagan. (See also W73-13916) (Knapp-USGS)
W73-13934

NEW CONCEPTS FOR MANAGING THE GREAT LAKES WATER RESOURCES,
Ohio Dept. of Natural Resources, Columbus.
F. E. Morr.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 217-223, 1972. 1 fig.

Descriptors: *Great Lakes, *Interstate commissions, Planning, Political aspects, Comprehensive planning, Administration, Water resources development, Water supply, Water pollution control, Systems analysis, Model studies, Optimization.
Identifiers: *Great Lakes Basin Commission.

Public demand for abatement of pollution in the Great Lakes caused new legislation to be introduced to implement new research, regulations, and management programs. New legislation will require changes in methods of disposing of dredging spoils from the Great Lakes harbors so that they will not further contribute to pollution of the Great Lakes. New emphasis is being placed on the effects of thermal pollution, erosion and silt, and lake level fluctuations. A great problem is the dilemma created by the increased demand for electric power, causing a concurrent decline in water resources quality. (See also W73-13916) (Knapp-USGS)
W73-13935

A DISCUSSION OF PLANNING PROCEDURE IN TERMS OF THE OECD NINE BASIC WATER MANAGEMENT PROBLEMS,
Great Lakes Basin Commission, Ann Arbor, Mich.
L. T. Crook.
In: Water Management--Basic Issues; Organizational for Economic Cooperation and Development, Paris, France, p 225-237, 1972.

Descriptors: *Comprehensive planning, *Great Lakes Region, River basin planning, Water management (Applied), Political aspects, Administration, Interstate commissions.
Identifiers: *Great Lakes Basin Commission.

The OECD basic water management problems are discussed in light of techniques for comprehensive planning used in the Great Lakes and techniques and procedures developed by the Great Lakes Basin Commission. The nine OECD problems are: (1) criteria for planning; (2) objectives; (3) procedures for choice among alternatives; (4) divided jurisdictions; (5) divided administrative responsibilities; (6) special interest groups; (7) how to obtain agreement; (8) information services; and (9) apportionment of costs. (See also W73-13916) (Knapp-USGS)
W73-13936

COMPREHENSIVE PLANNING FOR THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
L. T. Crook.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 239-249, 1972.

Descriptors: *Great Lakes, *Interstate commissions, Planning, Political aspects, Comprehensive planning, Administration, Water resources development, Water supply, Water pollution control, Systems analysis, Model studies, Optimization.
Identifiers: *Great Lakes Basin Commission.

The technical activities of the Great Lakes Basin Commission are: (1) to serve as the principal agency for coordination of all plans for development of water and related land resources in the basin; (2) to prepare and keep up to date a comprehensive, coordinated plan for development of water and related resources (including all reasonable alternatives); (3) recommend long-range schedules of priorities for all phases of development, including the collection and analysis of basic data, for investigation, planning, and the construction of projects; and (4) foster and undertake such special studies of water and related land resources problems as are necessary for the preparation of the comprehensive plan. The coordination of plans under the Great Lakes Basin Commission does not establish another hierarchy or level of planning within the basin. No actual planning will be undertaken by the Commission staff unless capacity or initiative for such planning is not demonstrated among the existing organizations and institutions within the basin. By combined support, the total effective planning effort of federal, state, and other governmental organizations will be considerably magnified. (See also W73-13916) (Knapp-USGS)
W73-13937

INSTITUTIONAL ARRANGEMENTS FOR THE GREAT LAKES BASIN,
Pennsylvania Dept. of Forests and Waters, Harrisburg.
C. H. McConnell.
In: Water Management-Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 251-259, 1972.

Descriptors: *Water management (Applied), *Comprehensive planning, *Great Lakes region, *Jurisdiction, Legal aspects, Political aspects, State jurisdiction, Institutions, Administration, Administrative agencies, International Joint Commission.

Problems of divided jurisdiction in the Great Lakes basin and the types of institutions that can be used to solve the water and related land resources problems of the basin are discussed. As a result of the Boundary Water Treaty of 1909 the International Joint Commission (IJC) was established. The 1909 treaty gives the Commission responsibility in the following: to approve or refuse approval of all proposals for use, obstruction or diversion of the boundary waters on either side of the international boundary; and to investigate and make recommendations on problems along the frontier. An interstate compact also exists in the Great Lakes basin. The enabling legislation for the Great Lakes Commission provides that the purposes of the Compact are to: (1) promote the orderly, integrated and comprehensive development, use, and conservation of the water resources; (2) plan for the welfare and development of the water resources of the basin as a whole; (3) make it possible for the States of the basin and their people to derive the maximum benefits from utilization of public works; (4) advise in securing and maintaining a proper balance among industrial, commercial, agricultural, water supply, residential, recreational and other legitimate uses; and (5) establish and maintain an intergovernmental agency. (See also W73-13916) (Knapp-USGS)
W73-13938

RESEARCH IN SUPPORT OF PLANNING AND MANAGEMENT OF WATER AND RELATED LAND RESOURCES,
Federal Council for Science and Technology, Washington, D.C.
W. A. Hall.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 263-270, 1972.

Descriptors: *Research and development, *Water management (Applied), *Water resources development, Abstracts, Publication, Planning, Comprehensive planning.
Identifiers: Water Resources Scientific Information Center.

Research programs must be made compatible with the planning and management processes. There are four problems to be solved in dealing with this

question: (1) why research is necessary for effective water management; (2) how to make research programs compatible with management and at the same time maintain a broad objective perspective; (3) how to coordinate research in a multiagency, multigovernmental system; and (4) how to display results to get them used. The U. S. Office of Water Resources Research maintains a Water Resources Scientific Information Center. This Center provides scientific information from published reports in the form of abstracts. A semimonthly abstract bulletin is now being sent to professional persons in the field of water resources in the United States. It is also available, on request, for foreign subscription. (See also W73-13916) (Knapp-USGS)
W73-13939

RESEARCH ACTIVITIES NEEDED FOR PLANNING AND MANAGEMENT IN THE GREAT LAKES,
Army Engineer Div. North Central , Chicago, Ill.
W. W. Watkin, Jr.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 271-275, 1972.

Descriptors: *Research and development, *Water management (Applied), *Great Lakes region, Universities, Federal Government, Canada, United States, International Joint Commission, Interstate commissions, Planning, Comprehensive planning.
Identifiers: U. S. Army Corps of Engineers.

Great Lakes problems requiring research for their solution are identified. Examples are given of problems, the results of research, and how the results are related to decisionmaking. The examples given are primarily in terms of U. S. Army Corps of Engineers activities on behalf of the United States Government. Corps of Engineers reports are designed to provide descriptions of physical features pertinent to the proposed action; desires of those concerned; coordination with other agencies; special problems; alternative solutions; benefits; and costs. Since 1953 conferences on the Great Lakes have been held for formal interchange of knowledge in the fields of hydrology, meteorology, limnology, and fisheries. These are under the auspices of the International Association for Great Lakes Research. A Canada-United States organization called the International Great Lakes Study Group consists of representatives of federal and State agencies and universities. This group facilitates the exchange of information and provides informal coordination among the various research activities. It sponsors a data repository for the cataloging, storage, and circulation of basic data. The Committee on Institutional Cooperation was established in 1958 by the presidents of the 11 major universities in the Great Lakes region of the U.S. (See also W73-13916) (Knapp-USGS)
W73-13940

THE INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES: AN INTERNATIONAL, INTERAGENCY AND INTERDISCIPLINARY APPROACH TO A RESEARCH PROGRAMME IN WATER RESOURCES,
Meteorological Service of Canada, Ottawa (Ontario).
T. L. Richards, and W. J. Drescher.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 277-286, 1972.

Descriptors: *Research and development, *Great Lakes region, *International commissions, *International Hydrological Decade, Comprehensive planning, Water management (Applied), Water resources development, Administration, Political aspects.
Identifiers: *International Field Year for the Great Lakes.

The International Field Year for the Great Lakes (IFYGL) was organized and designed to undertake an international and interdisciplinary research program. Its research was developed internationally under the Canadian and United States National Committees for the International Hydrogical Decade. Three problems are of concern in the IFYGL study; divided jurisdiction, divided administrative responsibility, and integrating information services. Problems associated with divided jurisdiction have been few and relatively minor. To date, only two have required referral to diplomatic channels. In both cases, (1) surveillance flights over foreign land areas, and (2) the movement of an army research team across an international border, immediate and sympathetic attention is being received. Individual agencies on each side of the border assumed responsibilities for specific facilities and at present, agencies and universities are committing themselves to specific research programs under contract. Where programs are identical or overlap, the organizations will work together as coordinated task forces. As a result, problems of divided administrative responsibilities have not appeared. (See also W73-13916) (Knapp-USGS)
W73-13941

THE CANADA CENTRE FOR INLAND WATERS: AN APPROACH TO RESEARCH CO-ORDINATION,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
A. T. Prince, and J. P. Bruce.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 287-300, 1972.

Descriptors: *Comprehensive planning, *Research and development, *Canada, *Water management (Applied), Water resources development, International commissions, Federal Government, Administration.
Identifiers: *Canada Centre for Inland Waters.

Responsibility for water resource management in Canada is divided between federal, provincial, and municipal levels of government. While ownership of the resource rests with the provinces, the federal government has responsibilities in connection with navigation, fisheries, and international waters. In the conduct and support of research which will benefit all parts of Canada, the major role should be played by the federal government. From the inception of the Canada Centre for Inland Waters, the main program has been in the fields of pollution abatement and water quality, all aspects of limnology, hydraulics problems peculiar to Canada, and socioeconomic studies related to these fields. The support facilities of the Centre, including ships, machine shops, computer facilities, library, etc., were planned specially to serve university needs as well as the other activities of the Centre. The broad objectives of the federal government in establishing the CCIW were the restoration and protection of the environment in regions where heavy pressures are being exerted on the water resource, and the protection and enhancement of national income in the Great Lakes area, Canada's most productive region. These objectives were to be achieved through improved management of water resources and the maintenance of good water quality standards. (See also W73-13916) (Knapp-USGS)
W73-13942

THE ROLE OF THE INTERNATIONAL JOINT COMMISSION,
International Joint Commission-United States and Canada.
E. W. Weber.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 303-309, 1972. 4 ref.

Descriptors: *International Joint Commission, *International waters, International Commissions, Canada, United States, Water management (Applied), Administration, Comprehensive planning.

The purpose of the Boundary Waters Treaty of 1909 was to prevent disputes regarding the use of boundary waters and to settle all questions between the United States and the Dominion of Canada involving the rights, obligations, or interests of either. To accomplish the purpose and to carry out the specific provisions of the Treaty, the two countries agreed to establish and maintain an International Joint Commission composed of six commissioners, three appointed by the President of the United States and three by the Government of Canada. Briefly the responsibilities of the Commission are of three general types: (1) a power delegated by the two countries to approve or disapprove proposals for uses that would affect the levels or flows or boundary waters (i.e. waters forming the boundary) and waters crossing the boundary under certain conditions, (2) a duty to investigate, report, and make recommendations to the two countries on any question referred to it by either government, and (3) a power to decide on any question which the two governments agree, through official governmental actions, to refer to the Commission for consideration and decision. (See also W73-13916) (Knapp-USGS)
W73-13943

CANADIAN-UNITED STATES DEVELOPMENT OF THE COLUMBIA RIVER AS RELATED TO ARRANGEMENTS FOR POWER DEVELOPMENT IN THE U. S. PACIFIC NORTHWEST,
Pacific Power and Light Co., Richland, Wash.
G. L. Beard.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 311-324, 1972. 1 photo.

Descriptors: *Columbia River, *International waters, *International commissions, *Water resources development, International Joint Commission, Water management (Applied), Hydroelectric power, Comprehensive planning.
Identifiers: *Columbia River Treaty.

The Columbia River basin is a relatively uncomplicated example of a large and important hydrographic basin which straddles an international boundary. The basin's main river, the Columbia, has its headwaters in Canada and its terminus in the United States. Electric power is an important factor in selecting the choice of approach to water management in a basin and the cost apportionment arrangements developed. The Columbia River Treaty was signed on January 17, 1961. The Treaty provides that Canada will build three large storage projects on her side of the border and the United States is permitted to build Libby Dam which will back water into Canada. Notwithstanding the location of the Columbia River basin within each of two sovereign countries, unified development of its water resources is now being achieved. (See also W73-13916) (Knapp-USGS)
W73-13944

THE REGIONAL DEVELOPMENT APPROACH FOR MANAGING WATER IN SPAIN,
Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia.
J. M. M. Mendiluce.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 335-336, 1972.

Descriptors: *Water resources development, *Comprehensive planning, *Water management (Applied), *Regional development, Planning, Water transfer, Inter-basin transfers, Administration.
Identifiers: *Spain.

Spain, with its very old traditions and experience with water on a hydrologic basis, has recently shifted its approach to water management by focusing on regional and economic developments as a more practical approach for achieving objectives. In the past, Spain was oriented around the hydrographic approach to water management. This approach was satisfactory when the water demands in a basin did not exceed the supply in that basin, but today, it is necessary to consider larger areas than hydrographic units, as planners and developers have become aware of the need to approach water problems from viewpoints more comprehensive than a river basin alone. (See also W73-13916) (Knapp-USGS)
W73-13945

OBJECTIVES OF WATER MANAGEMENT IN GERMANY,
Bundesministerium des Innern, Bonn (West Germany).
H. Muhleck.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 339-342, 1972.

Descriptors: *Water management (Applied), *Governments, Water law, Comprehensive planning, Regional development, Regional economics, Administration.
Identifiers: *Germany.

In the Federal Republic of Germany, water management is defined as the purposive adjustment of all human influences on surface and underground waters. Water management planning and programs are accordingly oriented towards the requirements of the total national economy and its objectives. Specific governmental programs concern equalization of regional differences of economic resources, improvement of the agricultural structure, and promotion of relatively small enterprises. In industrial centers, water associations have, in many cases, been set up to carry out the water management of larger river areas according to uniform conditions. The tasks of the associations also include wastewater treatment for which collective purification plants are being constructed on a large scale. (See also W73-13916) (Knapp-USGS)
W73-13946

THE ITALIAN PROGRAMME OF THE 'CASSA PER IL MEZZOGIORNO' AS AN ILLUSTRATION OF MEANS TO ACHIEVE ECONOMIC DEVELOPMENT OBJECTIVES,
Bureau of Scientific Research and Water Coordination Use of 'Cassa per Il Mezzoriorono', Rome (Italy).
R. Passino.

Descriptors: *Water resources development, *Regional development, Water law, Comprehensive planning, Legal aspects, Administration, Regional economics, Governments.
Identifiers: *Italy.

Because water resources have played an important role in the economic development of the Italian regions, the Italian State, since the country was unified in 1860, has promoted technical and administrative bodies responsible both for public and private use of water. Among its technical services, the unified State instituted the Italian Hydrographic Service, operating with the aid of many other technical and scientific bodies, and laid the foundation for an appropriate system of laws aimed at regulating the development and utilization of water resources. Ultimately a comprehensive Water Act was promulgated, on December 11, 1933. All Italian waterworks, some of them of exceptional importance, have been carried out and managed in the framework of this legislation, which recognizes water as belonging to the community, and places special emphasis on the concept of concession for the use of water, to be granted to the users. In order to achieve these objectives, the 'Cassa per il Mezzogiorno', a public authority with large financial and administrative independence, was instituted in 1950, with the responsibility of a long-term development program. The characteristic of the special action taken by the Italian Government through the 'Cassa per il Mezzogiorno' is an organically planned long-term multisector program. Water supply for many different purposes has been, in this frame, the most important sector of interest. (See also W73-13916) (Knapp-USGS)
W73-13947

OBJECTIVES OF WATER MANAGEMENT IN JAPAN,
Ministry of Construction, Tokyo (Japan). River Bureau.
R. Higano.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 351-354, 1972.

Descriptors: *Water resources development, *Regional development, Water law, Comprehensive planning, Legal aspects, Administration, Regional economics, Governments.
Identifiers: *Japan.

Water management objectives, as stated in the Japanese River Law, are: to contribute to the land conservation and development of the country and thereby to maintain public security and promote public welfare, by administering rivers comprehensively to prevent occurrence of damage due to floods, high tides, etc., utilize rivers properly, and maintain the normal functions of the river water. In water resources development, the objectives of the Resources Development Promotion Law are: the promotion of the comprehensive development and the rational utilization of the water resources in the whole water system of rivers, together with the conservation and protection of the headwaters, in order to secure the supply of water for areas which need water owing to the industrial development or growth and the increase in the urban population, and thereby to contribute to the growth of the national economy and the improvement of the people's living. (See also W73-13916) (Knapp-USGS)
W73-13948

PROCEDURES USED IN JAPAN FOR CHOOSING AMONG WATER MANAGEMENT ALTERNATIVES,
Ministry of Construction, Tokyo (Japan). River Bureau.
R. Higano.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 357-360, 1972.

Descriptors: *Water resources development, *Regional development, Water law, Comprehensive planning, Legal aspects, Administration, Regional economics, Governments.
Identifiers: *Japan.

In Japan, class A rivers are administered by the State and class B rivers by prefectures, in accordance with the provisions of the River Law. In designating a river as a class A river, the opionions of the River Council and of the prefectural governors concerned are heard. The governors present their opinions following the decision of the general assemblies of the respective prefectures. A river adminstrator fixes a basic plan of work for each water system he administers to ensure comprehensive administration of rivers by taking into consideration the conditions of flood damage caused in the past, present status of utilization of water resources and their development, and also by effecting coordination with the comprehensive national land development plan. In order to protect public health from adverse effects of heavy metals such as organic mercury and cadmium, and various other kinds of contaminating substances, uniform standards of allowable limits are to be established for all waters. (See also W73-13916) (Knapp-USGS)
W73-13949

A TECHNICAL SOLUTION TO THE PROBLEM OF DIVIDED JURISDICTION OF WATER RESOURCE DEVELOPMENT IN SPAIN AND PORTUGAL,
Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia.
J. M. M. Mendiluce.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 375-376, 1972.

Descriptors: *International waters, *Administration, *International commissions, International law, Treaties, Political aspects, Comprehensive planning, Hydroelectric power, Dams, Regulation.
Identifiers: *Spain, *Portugal.

Spain and Portugal have developed a technical solution to overcome the problem of divided jurisdiction in water management for waters of joint interest. This solution has been developed in connection with the control of water, principally for electric power production, although water supply and irrigation have been considered in the development of the solution. The solution depended on accurate knowledge of the regulation of water flow. An international agreement for this purpose was ratified by both countries in 1969. The agreement considers all the potential energy which may be produced in the river basins in which there is mutual international interest. Three major river basins are in both countries: Mino. Tajo, and Guadiana. A joint report was prepared in which an evaluation showed that the electric power potential of the Guadiana basin should go to Portugal; the electrical power potential of the Tajo basin should go to Spain, and the Mino could be used to adjust differences in kWh between the two countries. (See also W73-13916) (Knapp-USGS)
W73-13950

THE LICENCE SYSTEM OF THE SWEDISH ENVIRONMENT PROTECTION ACT AS A MEANS TO OVERCOME DIVIDED ADMINISTRATIVE RESPONSIBILITIES,
National Swedish Environment Protection Board, Stockholm.
L. Hannerz.
In: Water Management-Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 395-399, 1972.

Descriptors: *Water management (Applied), *Water law, *Regulation, *Water pollution control, *Water resources development, Political aspects, Administration, Planning, Comprehensive planning, Environment, Public health, Ecology.
Identifiers: *Sweden.

The main public interest in the utilization of water resources in Sweden includes water supply, recreation, hydroelectric power generation, fishery, and general nature conservancy aspects. To this is added the needs of industry and municipalities to discharge wastes into water. Conflicting interests with respect to alternative uses of water resources are balanced by legislative means. Since July 1969 Sweden has had a new law in force relating to the protection against a wider variety of activities which may threaten the environment. This law, the Environment Protection Act, regulates the problems of water pollution, air pollution, noise and other disturbances arising from land-based activities. Water management in Sweden today is characterized by the central position in the licensing procedures by the Environment Pro-

tection Board, and by the good relations between the Board, industry, and the local government committees. So far, however, long-term plans for the use of the water resources have been worked out only for a few small regions and a nationwide plan for water management has only been informally discussed. (See also W73-13916) (Knapp-USGS)
W73-13951

ENVIRONMENTAL PROTECTION THROUGH APPLICATION OF THE NORWEGIAN WATER LAW,
Norsk Institutt for Vannforskning, Blindern.
K. Baalsrud.
In: Water Management-Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 403-405, 1972.

Descriptors: *Water management (Applied), *Water law, *Regulation, *Water resources development, *Water pollution control, Political aspects, Administration, Planning, Comprehensive planning, Environment, Public health, Ecology.
Identifiers: *Norway.

In water resources development special interest groups are often at a great disadvantage when matched against large and well organized groups such as industrial establishments. Arrangements to protect these interests in Norway date from 1941. The basis for these administrative measures is the Water Resources Act of 1940. Norway's arrangement is built around a review of permits for waste discharges by the Norwegian Water Resources and Electricity Board, a directorate in the Ministry of Industry. When the Board receives an application for a permit, it publishes the request in the newspapers. Any person or group interested in commenting or objecting to the permit is invited to do so. When satisfied with the understanding of the situation, the Board proposes to the Ministry of Industry that the permit should be approved, and designates the conditions under which it must be carried out. The Board may alter or impose higher conditions than were included in the initial application. If the applicant objects to the conditions, he can appeal to the King for reconsideration of the case. Although a discharger may have all legal rights through a permit for discharge, he is still fully responsible for any damage, inconveniences, or adverse effects to which the discharge may give rise. (See also W73-13916) (Knapp-USGS)
W73-13952

FINNISH WATERCOURTS: AN EXAMPLE OF A COMPENSATION PROCEDURE IN THE LOKKA ARTIFICIAL LAKE PROJECT,
Sunnittelukeskus-MKR, Helsinki (Finland).
O. Perakyla.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 409-413, 1972. 1 fig.

Descriptors: *Water law, *Administration, *Adjudication procedure, *Water resources development, Legal aspects, Water rights, Appropriation, Compensation, Equitable apportionment, Legal review, Water policy, Comprehensive planning.
Identifiers: *Finland.

The water law of Finland provides various possibilities to implement water development programs. The law also prescribes procedures to compensate those affected adversely by damage and inconvenience which may result from such developments. Prior to 1961, permission to develop water management projects was granted by a water commission. Since then a new water law has established three water courts which are equivalent to the former commission and are composed of a judge as chairman and two water court engineers as members. A performance survey compares the benefits of the development project on a large area against the possibilities of a local disadvantage. The National Water Board of Finland, after examining the case, states whether it believes a water pollution problem will result. If the Board believes pollution will result, under the water law, a permit from the water court must be obtained. If the court's decision is not acceptable to the respective parties, those who are dissatisfied may appeal the case to the Supreme Administrative Court of Finland. (See also W73-13916) (Knapp-USGS)
W73-13953

APPROACH USED IN THE DUTCH DELTA PLAN TO COMPENSATE ADVERSELY AFFECTED INTERESTS,
Ministry of Traffic and Public Works, the Hague (Netherlands).
A. Volker.
In: Water Management-Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 415-417, 1972.

Descriptors: *Water law, *Administration, *Adjudication procedure, *Water resources development, Legal aspects, Water rights, Appropriation, Compensation, Equitable apportionment, Legal review, Water policy, Comprehensive planning.
Identifiers: *The Netherlands.

In the Netherlands, there are a great many special interest groups, each with its own objectives. In the case of the Dutch Delta Plan, the interests of small groups, such as those of oyster, mussel, and lobster fisheries, had to give way to the overriding national interest, which is protection against storms from the sea, provision of freshwater, and drainage. Therefore, in Holland, the special interests could not be protected, and it was necessary to devise means to compensate the parties affected adversely by the plan. Both informal and formal arrangements were developed for this purpose. A law provided compensation for these interests. The compensation is related to the degree that the income of the affected party is influenced. If the affected party is not satisfied with the decision of the Minister, he may appeal against the decision to the district or provincial court, and possibly, to higher courts. (See also W73-13916) (Knapp-USGS)
W73-13954

TWO ILLUSTRATIONS OF COMPENSATION PROCEDURES FOR OBTAINING AGREEMENT IN WATER MANAGEMENT PROGRAMMES IN SPAIN,
Consejo Superior di Investigaciones Cientificas, Madrid (Spain). Instituto de Hidrologia.
J. M. M. Mediluce.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 419-420, 1972.

Descriptors: *Water law, *Administration, *Adjudication procedure, *Water resources development, Legal aspects, Water rights, Appropriation, Compensation, Equitable apportionment, Legal review, Water policy, Comprehensive planning.
Identifiers: *Spain.

Spain has procedures by which agreements on water resource development programs are obtained when local interests are adversely affected by projects designed to benefit the region or country as a whole. One of the choices is to pay the affected parties at levels higher than would be provided in a free market sale when their property is affected. A second choice is to relocate individuals or villages (with partial government subvention). A third choice is to protect existing lands or villages against project damages, such as floods, and in this case the developer (government or private) pays the total cost of protection. (See also W73-13916) (Knapp-USGS)
W73-13955

PROCEDURES USED IN THE UNITED KINGDOM FOR INTEGRATING INFORMATION NEEDED IN WATER MANAGEMENT DISCUSSIONS,
Department of the Environment, London (England) Water and Sewage Div
J. E. Beddoe
In: Water Management--Basic Issues, Organization for Economic Cooperation and Development, Paris, France, p 423-427, 1972.

Descriptors: *Water law, *Administration, *Adjudication procedure, *Water resources development, *Information exchange, Legal aspects, Water rights, Appropriation, Compensation, Equitable apportionment, Legal review, Water policy, Comprehensive planning.
Identifiers: *United Kingdom.

In England, water resources management is conducted within governmental machinery by well-established means of settling interdepartmental disputes through the Cabinet at the appropriate cabinet committee and by planning public expenditures to establish economic priorities and a comprehensive system of land use planning. Internal conflicts arise because there are three separate sets of bodies responsible for various aspects of water resources management. External conflicts arise because many water schemes change the appearance of the landscape or require the acquisition of farmland. Because works for the development of water resources or the prevention of pollution require planning permission, there is automatic liaison between the authorities responsible for controlling land use and water management bodies. Any authority promoting a major scheme discusses its proposals with nonstatutory groups such as local amenity societes, anglers associations, and representatives of farming interests. The Minister of Housing and Local Government may hold a public local inquiry to hear the case for the scheme and the objector's views. (See also W73-13916) (Knapp-USGS)
W73-13956

THE GERMAN GENERAL WATER SCHEME AS A MEANS FOR INTEGRATING DECISION MAKING INFORMATION,
Bundesministerium des Innern, Bonn (West Germany).
H. Muhleck.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 429-431, 1972.

Descriptors: *Data collections, *Hydrologic data, *Water balance, *Comprehensive planning, Social aspects, Legal aspects, Water management (Applied), Appropriation, Administration, Water policy, Information exchange, Documentation.
Identifiers: *Germany.

The General Water Schemes (GWS) of the Federal Republic of Germany consist of a data collecting, analyzing, and evaluation process intended to provide information for the decision maker. General Water Schemes are the result of large-scale investigations of available water resources, water needs, and the possibilities for the management of the resources in terms of quality and quantity. General Water Schemes data are obtained for large-scale water management policy. Knowledge is acquired from inventories of the natural conditions in the fields of geology, geography, meteorology, hydrology, sociodemographic investigations, and economic, agricultural, and other surveys. The GWS is not published, but it also is not secret. If, for example, an industrialist is interested in knowing where he will find enough water for a new factory he will get an answer from the water authority on the basis of information contained in the GWS. (See also W73-13916) (Knapp-USGS)
W73-13957

GERMAN APPROACHES TO PAYING COSTS OF WATER MANAGEMENT PROGRAMMES,
Bundesministerium des Innern, Bonn (West Germany).
H. Muhleck.
In: Water Management--Basic Issues; Organization for Economic Cooperation and Development, Paris, France, p 443-444, 1972.

Descriptors: *Water management (Applied), *Water costs, *Cost sharing, *Water pollution control, *Cost allocation, Economics, Comprehensive planning, Administration, Grants, Taxes, Pollution taxes (Charges).
Identifiers: *Germany.

In the Federal Republic of Germany, financing of pollution control is generally based on the principle that everyone who produces pollution has to pay for the control of it. Benefits derived by water users from water pollution control do not oblige these users to share the costs of pollution control. No difference is made if waste water is discharged to a treatment plant or into the river, because the river basin must be regarded as a whole. (See also W73-13916) (Knapp-USGS)
W73-13958

REGIONAL WORKSHOP ON WATER RESOURCES, ENVIRONMENT, AND NATIONAL DEVELOPMENT.
For primary bibliographic entry see Field 05G.
W73-13966

INSTITUTIONAL IMPLICATIONS OF U.S. DEEPWATER PORT DEVELOPMENT FOR CRUDE OIL IMPORTS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-13987

ALTERNATIVES FOR A NEW SHRIMP LAW IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
H. C. Loesch.
Available from NTIS, Springfield, Va. 22151 as COM-73-10540 - Price $3.00 printed copy; $1.45 microfiche. Louisiana State University Center for Wetland Resources Sea Grant Preprint, 1973. 13 p, 6 ref. NOAA Sea Grant 2-35231.

Descriptors: *Shrimp, *Commercial shellfish, *Fish conservation, *Louisiana, Legislation, Legal aspects, Fish management, Projections, Decision making.
Identifiers: *Shrimp law proposals (La).

Ideal shrimp fishing regulations lie somewhere between the extremes of no regulations at all and regulations forbidding shrimping in any state waters. The concept of ideal varies with the person or group seeking to enhance shrimping possibilities for himself and for his group and for the objects of the shrimp management. This report deals with (1) different groups concerned with management, (2) methods of management, and (3) possible laws for Louisiana. Louisiana Wild Life and Fisheries Commission has a director, two assistant directors, and a chief of the Oyster, Water Bottoms and Seafood Division. The manner and degree of fishing intensity can be modified in several ways by law and regulations. If the catch per unit of effort has decreased to the point where overfishing a stock is taking place, then the fishing pressure should be decreased. Reducing the fishing pressure may be done by any one or a combination of the methods presented. (Woodard-USGS)
W73-14107

6G. Ecologic Impact of Water Development

HAMLIN BEACH STATE PARK COOPERATIVE BEACH EROSION CONTROL PROJECT, LAKE ONTARIO, MONROE COUNTY, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer Districts, Buffalo, N.Y.
For primary bibliographic entry see Field 08D.
W73-13746

FINAL ENVIRONMENTAL IMPACT STATEMENT, SOPE CREEK DRAINAGE AREA, COBB COUNTY, GEORGIA--AMENDMENT TO ENVIRONMENTAL IMPACT STATEMENT, COBB COUNTY SEWERAGE IMPROVEMENT PROJECT, JULY 1971.
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 05D.
W73-13764

RIVER ECOLOGY AND MAN. PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM.

Held at Amherst, Massachusetts, June 20-23, 1971. 463 p. Academic Press: New York, N.Y., 1972. Pr. $11.50.
Identifiers: Books, *Ecology, Fauna, Flora, International activities, Man-made pollution, Proceedings, *River ecology, Symposiums.

This book contains an integrated series of reports by scientists, engineers and social scientists on rivers and man's interaction with them. Information included presents descriptions of the flora, fauna, chemical composition and geomorphometry of rivers; case histories of specific rivers throughout the world; full discussions of the effects of various river uses on morphometry, discharge, and sedimentation; detailed analyses of the impact of heat, radionuclides, pesticides, and industrial wastes on river ecosystems; and the economic, environmental, and political implication of multiple use of rivers. The content begins with a section describing what a river is, including a geomorphic and chemical overview, a zoological description and plant ecology in flowing water. The 2nd section, uses of a river--past and present, covers man's impact on the Columbia River, a study in water quality management on the Delaware River, man and the Illinois River, a case history of the Nile River and the River Thames and the uses of the Danube River. The 3rd section, effects of river uses, covers the following topics: regulated discharge and the stream environment; morphometric changes; sedimentation; a comparative assessment of thermal effects in some British and North American rivers; effects of pesticides and industrial waste on surface water use; radionuclides in river systems; and nutrients. The final section, rationalization of multiple use, discusses multiple use of rivers and of river systems and political aspects of multiple use. The book ends with a summary of the papers presented at the symposium.--Copyright 1973, Biological Abstracts, Inc.
W73-13791

SEWAGE SLUDGE INCORPORATION IN EXPERIMENTAL FIELD PLOTS TO EVALUATE HAZARDS AND BENEFITS, AND DEVELOP TECHNIQUES FOR OPTIMIZING BENEFITS AND MINIMIZE HAZARDS (FINAL ENVIRONMENTAL STATEMENT).
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-13860

BOOMER CREEK CHANNEL IMPROVEMENT (LOCAL FLOOD PROTECTION PROJECT), STILLWATER, OKLAHOMA, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W73-13861

PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS--PROPOSED GUIDELINES, PART II.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13873

MOLOKAI HOMESTEADERS COOPERATIVE ASS'N. V. MORTON (ACTION FOR PRELIMINARY INJUNCTION TO PREVENT BOARD OF LAND AND NATURAL RESOURCES FROM ENTERING INTO AGREEMENT WITH CORPORATION FOR USE OF PIPELINE).
For primary bibliographic entry see Field 06E.
W73-13899

STATEMENT,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13917

STATEMENT,
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 06E.
W73-13918

UNITED STATES WATER POLICY,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13919

RECENT DEVELOPMENTS IN WATER MANAGEMENT POLICY OF THE UNITED STATES GOVERNMENT,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13920

REGIONAL WORKSHOP ON WATER RESOURCES, ENVIRONMENT, AND NATIONAL DEVELOPMENT.
For primary bibliographic entry see Field 05G.
W73-13966

PIPELINES AND TROUT WATER,
For primary bibliographic entry see Field 04C.
W73-14048

PERIWINKLE CREEK RC AND D PROJECT MEASURE, UPPER WILLAMETTE RC AND D PROJECT, OREGON (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-14106

07. RESOURCES DATA

7A. Network Design

NETWORK PLANNING AND DESIGN: PART A, REVIEW OF SCIENTIFIC APPROACHES AND PROBLEMS IN HYDROLOGICAL NETWORK DESIGN,
For primary bibliographic entry see Field 02A.
W73-13771

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
B. Bobee, and G. Morin.
INRS-Eau Technical Report No 6, September 1972. 156 p.

Descriptors: *Statistical models, *Hydrologic data, *Distribution patterns.
Identifiers: Pearson III Distribution, Confidence intervals.

Distribution functions of the statistical order for the Pearson III law and its derived forms is used for determining the confidence intervals associated with this law. This method is used to establish the confidence intervals of this law and its derived forms. These data are presented in tables and graphs of the three appendices of the report. (INRS-Eau)
W73-13989

EXTENT OF THE PEARSON III LAW: THE CASE OF NEGATIVE SKEWNESS (EXTENSION DE LA LOI PEARSON III: LE CAS DE L'ASYMETRIE NEGATIVE),
National Inst. of Scientific Research, Quebec.
B. Bobee, and G. Morin.
INRS-Eau Technical Report No 5, September 1972. 88 p.

Descriptors: *Statistical methods, *Distribution patterns, *Hydrologic data.
Identifiers: Pearson distribution, Negative skewness.

It is possible to define a derived form of Pearson III law with negative skewness. The relations between these two forms and between their statistical order are established. The distribution functions of the statistical order for the two forms are calculated. (INRS-Eau)
W73-13990

ERRORS IN THE ESTIMATION OF HYDROLOGIC VARIATES IN THE CASE OF PEARSON III LAW (ERREURS SUR L'ESTIMATION DES VARIATES HYDROLOGIQUES DANS LE CAS DE LA LOI PEARSON III),
National Inst. of Scientific Research, Quebec.
B. Bobee.
INRS-Eau Technical Report No 2, May 1972. 31 p.

Descriptors: *Hydrologic data, *Statistical models, Data collections.
Identifiers: *Pearson III distribution.

By the application of results from statistical theory, errors can be determined in the estimation of certain variates (i.e., moments, coefficient of variation, coefficient of skewness, event of given return period) in the case of Pearson III and Log Pearson III laws. The mean of a sample from a gamma population is shown to be distributed in accordance with the Pearson III law. (INRS-Eau)
W73-13993

A PLANNING MODEL FOR PRELIMINARY NETWORK DESIGN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-14173

7B. Data Acquisition

CALIFORNIA COAST NEARSHORE PROCESSES STUDY, ERTS-A EXPERIMENT NO. 088,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 02L.
W73-13681

LAND USE CLASSIFICATION USING TEXTURE INFORMATION IN ERTS-A MSS IMAGERY,
Kansas Univ., Center for Research, Inc., Lawrence. Remote Sensing Lab.
K. Shanmugam, R. M. Haralick, and R. Bosley

Descriptors: *Land use, *Land classification, *Remote sensing, *Aerial photography, Methodology, Satellites (Artificial), Photogrammetry, Cameras, Mapping, Surveys, Terrain analysis.
Identifiers: *ERTS imagery, Textural features, Matrix.

A procedure is described for determining the textural features on ERTS imagery. The textural features developed are extracted from the matrix of relative frequencies Pij with which two neighboring resolution cells with a specific spatial relationship occur on the image, one with grey tone i and the other with grey tone j. Such matrices are calculated for each MSS image for different angular relationships between neighboring resolution cells as well as for different distances between them. From each of the different matrices features are extracted which contain information about the homogeneity of the image, linear dependencies in grey tone values, contrast, and other image qualities; these features are used for image classification. By use of the developed textural feature extraction-classification algorithm, part of an ERTS MSS image over the California coast was processed. A 5400-square-mile area on the image was divided into 648 subimages, each covering an area of approximately 8.5 square miles. The ground truth for the use types for 629 of these images was obtained through photo interpretation. The textural features were computed for 629 of the 648 subimages. Each subimage was then classified as belonging to one of seven possible land use categories, part of the data being used for training and the remainder of the data for testing the classification accuracy. Over 70% of the test samples can be correctly classified using the textural features of only one of the four MSS images. (Woodard-USGS)
W73-13685

A CLOSE-INTERVAL SYRINGE SAMPLER,
Alaska Univ., College. Inst. of Marine Science.
R. C. Clasby, W. S. Reeburgh, and V. Alexander.
Limnol Oceanogr. Vol 17, No 4, p 632-633, 1972. Illus.
Identifiers: *Close interval syringe, Sampling, *Water samplers.

A close-interval water sampler, with small cross-section which allows in situ flushing has been built, using hypodermic syringes. This sampler is ideally suited for use beneath ice or in areas where properties vary greatly with depth.--Copyright 1973, Biological Abstracts, Inc.
W73-13719

REMOTE SENSING STUDY OF THERMAL DISCHARGES TO LAKE MICHIGAN, ILLINOIS--INDIANA-MICHIGAN.
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-13747

ESTIMATION OF AVERAGE DAILY RAINFALL FROM SATELLITE CLOUD PHOTOGRAPHS,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 02B.
W73-13750

LIMITATIONS OF THE ELECTRICAL RESISTIVITY METHOD FOR DETECTING LANDFILL LEACHATE IN ALLUVIAL DEPOSITS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 05B.
W73-13758

RAINFALL INTENSITY INSTRUMENTS AND MEASUREMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 02B.
W73-13816

RELATIONSHIP BETWEEN STREAM WATER TEMPERATURE AND AMBIANT AIR TEMPERATURE (RELATION ENTRE LA TEMPERATURE DE L'EAU D'UNE RIVIERE ET LA TEMPERATURE DE L'AIR AMBIANT),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 02E.
W73-13992

CONSTRUCTION AND USE OF AN INEXPENSIVE RAIN GAUGE,
Texas A and M Univ., College Station. Dept. of Range Science.
P. D. Ohlenbusch.
Journal of Range Management, Vol 25, No 5, p 405-406, Sept. 1972. 1 fig, 1 tab.

Descriptors: *Rain gages, *Design data, *Construction costs, *Costs, *Water measurement, Arid climates, Semiarid climates, Rainfall.

An inexpensive, wind-proof rain gage, designed for use in arid and semiarid climates, was developed for measuring precipitation at remote locations. Types of materials needed for construction are listed, the average cost for one gage is $9.00, plus one hour labor. Gages in use over one year have withstood winds in excess of 50 miles per hour. Design of the stand allows ventilation, keeping the liquid in the gage cool, and helps reduce evaporation. Gage reading is recommended along with minimum maintenance work, approximately every three weeks. (Bahre-Arizona)
W73-14003

USE OF THE ELECTRON MICROSCOPE HYDRATION CHAMBER TO STUDY SMALL WATER DROPS,
Roswell Park Memorial Inst., Buffalo, N.Y. Electron Optics Lab.
For primary bibliographic entry see Field 02B.
W73-14024

INFLUENCE OF ABSORPTION COEFFICIENT ON REFLECTANCE OF WATER,
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 05A.
W73-14082

STUDY OF THE QUALITY OF FORMATION WATERS FROM ELECTRIC LOGS IN THE SALT AREA, CALCUTTA,
Central Groundwater Board, Calcutta (India).
For primary bibliographic entry see Field 02K.
W73-14117

SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM EARTH RESOURCES TECHNOLOGY SATELLITE-1, MARCH 5-9, 1973, VOLUME II SUMMARY OF RESULTS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.

Available from the National Techinal Information Service as TMX-66283, $7.25 in paper copy $1.45

microfiche. Preprint X-650-73-127, May 1973, 94 p.

escriptors: *Remote sensing, *Satellites (Artificial), *Mapping, *Surveys, *Telemetry, Solar diation, Albedo, Geologic mapping, Infrared diation, Oceanography, Land use, Urbanization, ater resources, Mining, Data collections.
entifiers: *ERTS.

he first Earth Resources Technology Satellite RTS-1) was launched on July 23, 1972. In the ven months since it was activated, over 34,000 enes of the earth have been obtained, covering major land masses and about 75 percent of the orld's land area. Some areas, such as the United ates, have been imaged at least twelve times. he purpose of the ERTS program is to provide an sessment of remote sensing from a satellite as a chnique for inventorying and monitoring the rth's resources to provide for better manageent of these resources. This Symposium proded the first open forum where the users of the RTS data had the opportunity to present the sigficant accomplishments from their investigaons. It also provided the first opportunity for presentatives of federal, state, and local ornizations to present their views on how ERTS ta are being used and will be used for solving erational resource management problems. (See 73-14127 thru W73-14138)
73-14126

EVIEW OF ERTS-1 STATUS,
ational Aeronautics and Space Administration, reenbelt, Md. Goddard Space Flight Center.
. Nordberg.
: Symposium on Significant Results Obtained om Earth Resources Technology Satellite-1; reenbelt, Md., March 5-9, 1973: Vol II, Summary Results, National Aeronautics and Space Adn., Goddard Space Flight Center Publication X-0-73-127, p 13-16, May 1973.

escriptors: *Remote sensing, *Satellites (Artificial), *Mapping, *Surveys, *Telemetry, Solar diation, Albedo, Geologic mapping, Infrared diation, Oceanography, Land use, Urbanization, ater resources, Mining, Data collections.
entifiers: *ERTS.

RTS is a system; it consists of a spacecraft and a ry complex ground operation. The ground eration, to a large extent, outweighs the acecraft in complexity and significance. The acecraft carries sensors which measure and age sunlight reflected by the earth. The sensors e: (1) three return beam vidicon (RBV) television meras and (2) a multispectral scanner subsystem ISS). The two sensors are designed to measure nlight in three spectral bands which are nearly e same for both sensors; namely in the green and d portions of the visible spectrum, as well as in e infrared, which is invisible to the eye. The SS is also sensitive to a fourth band in the inared, near one-micrometer wavelength. When e satellite is not within receiving range of one of ur stations which are distributed over North nerica, measurements from each sensor are corded on wideband videotape recorders. The nsors aquire images of approximately 6 1/2 mln sq km of the earth's surface every day. The tellite also carries a data collection system CS) which acquires data transmitted from ound platforms distributed over North America. ne satellite retransmits the messages from these atforms to a central data analysis facility at the oddard Space Flight Center. (See also W73-126) (Knapp-USGS)
73-14127

ENTIFICATION AND MAPPING OF SOILS, EGETATION, AND WATER RESOURCES OF YNN COUNTY, TEXAS, BY COMPUTER NALYSIS OF ERTS MSS DATA,
rdue Univ., Lafayette, Ind.
M. F. Baumgardner, S. J. Kristof, and J. A. Henderson, Jr.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md., March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin., Goddard Space Flight Center Publication X-650-73-127, p 17-30, May 1973. 18 fig, 1 tab.

Descriptors: *Remote sensing, *Satellites (Artificial), *Land use, *Farms, Texas, Mapping, Vegetation, Surface waters, Soil erosion, Data collections, Data processing.
Identifiers: *ERTS, *Lynn County (Tex), *Soil mapping.

ERTS multispectral data were obtained over Lynn County, Texas. The test site was chosen because it embodies a variety of problems associated with the development and management of agricultural resources in the Southern Great Plains. Preliminary results suggest that ERTS data can be used successfully in semiarid regions to accomplish the following tasks: map and measure croplands; identify and map vegetative species and management differences in rangelands; map gross soil patterns and differences which may be related to agricultural and land-use management problems and practices; map and measure areas of surface water and indicate changes occurring with the passage of time which may be related to groundwater recharge; map and measure areas of crops damaged or destroyed by hail and windstorm; and map and measure areas of bare soil and related problems of erosion, and determine conservation needs. (See also W73-14126) (Knapp-USGS)
W73-14128

PRELIMINARY GEOLOGIC APPLICATION OF ERTS-1 IMAGERY IN ALASKA,
Geological Survey, Washington, D.C.
E. H. Lathram, I. L. Tailleur, W. W. Patton, Jr., and W. A. Fischer.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md., March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin., Goddard Space Flight Center Publication X-650-73-127, p 31-38, May 1973. 6 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Alaska, *Geologic mapping, Mining, Exploration, Oil fields, Environmental effects, Vegetation, Data collections, Data processing.
Identifiers: *ERTS.

ERTS-1 and Nimbus images, largely cloud-free, were obtained over all of Alaska. Close inspection reveals numerous dark linear features that proceed great distances across the image in a generally northeast and northwest direction. Many of these structural features were not previously known or had not been put together and recognized as continuous structures in the earth's crust. These features are important in reaching an understanding of metallogenetic relationships throughout Alaska. Previously unobtainable geologic structural information may accelerate the finding of oil. (See also W73-14126) (Knapp-USGS)
W73-14129

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
J. M. Miller, and A. E. Belon.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md., March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin., Goddard Space Flight Center Publication X-650-73-127, p 39-50, May 1973. 12 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Alaska, *Mapping, Geologic mapping, Land use, Ecology, Environment, Forests, Grasslands, Tundra, Snow surveys, Data collections, Data processing.
Identifiers: *ERTS.

Broadly structured, multidisciplinary environmental surveys of Alaskan resources are underway using ERTS data as a primary input. ERTS-1 images are being used in two ways to monitor herd activity. One is to map habitat favorable to caribou and the other is to locate and map environmental features that arise from large caribou aggregations. Typical winter grazing habitat includes mixed patterns of open spruce stands and treeless bogs. Maps of snowlines across Alaska are used to monitor the initiation and decay of the seasonal snow cover. Maps were made of the three predominant types of vegetation (moist tundra, low brush, and high brush), watershed drainages, geologic features indirectly relatable to economic minerals, and potential use classifications in an area that is susceptible to development of a transportation corridor. Mixed woods, coniferous forest, mixed herb-shrub and sedge associations, tidal flats, subalpine shrub-grass, alpine tundra, low elevation grasslands, and agricultural croplands may be distinguished. (See also W73-14126) (Knapp-USGS)
W73-14130

APPLICATION OF ERTS-1 IMAGERY TO FLOOD INUNDATION MAPPING,
Geological Survey, Iowa City, Iowa.
G. R. Hallberg, B. E. Hoyer, and A. Rango.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md, March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin, Goddard Space Flight Center Publication X-650-73-127, p 51-70, May 1973. 14 fig, 3 tab, 3 ref.

Descriptors: *Remote sensing, *Data collections, *Mapping, *Floods, *Iowa, Surveys, Monitoring, Data collections, Data processing.
Identifiers: *Flood mapping, *ERTS.

In September, 1972, heavy rains initiated major flooding in Southwestern Iowa throughout the East and West Nishnabotna River basins. The flood crest moved downstream between September 11 and 15. ERTS-1 multispectral scanner subsystem (MSS) imagery of the area was obtained on September 18 and 19. The time period critical for imagery acquisition is at least 7 days following flood recession. The capability of satellite imagery to map late summer flooding at a scale of 1:250,000 is exhibited by the agreement of interpreted flood boundaries obtained from ERTS-1 imagery to boundaries mapped by low altitude imagery and ground methods. The synoptic coverage of ERTS-1 allowed extension of the flood mapping to the West Nishnabotna River. Satellite imagery allows rapid appraisal of the areal extent of flood inundation for entire river systems. (See also W73-14126) (Knapp-USGS)
W73-14131

AGRICULTURE, FORESTRY AND RANGELAND RESOURCES,
Oregon State Univ., Corvallis.
C. E. Poulton.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md, March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin, Goddard Space Flight Center Publication X-650-73-127, p 71-99, May 1973. 20 fig, 9 tab, 16 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Land use, Mapping, Forests, Grasslands, Natural resources, Planning, Data collections, Data processing.
Identifiers: *ERTS.

The application of Earth Resources Technology Satellite imagery to real and practical problems is

reviewed. In the areas of agriculture, forestry, and rangeland resources, data from the ERTS-1 satellite are of substantial significance. The large area coverage of a single scene from the ERTS-1 satellite provides a perspective of county, state, and regional problems never before possible. In addition, the repetitive coverage of the system is especially well suited to the seasonally changing scene so important to the analysis and understanding of agricultural, forestry, and rangeland resources problems. The ERTS-1 system enables both stratification and sampling estimates of relatively small areas such as counties or subregions within a state. This suggests that one of the significant benefits of the ERTS will be through development of local crop statistics not now available. (See also W73-14126) (Knapp-USGS)
W73-14132

LAND USE AND MAPPING,
Dartmouth Coll., Hanover, N.H.
D. T. Lindgren, and R. B. Simpson.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md, March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin, Goddard Space Flight Center Publication X-650-73-127, p 100-105, May 1973. 6 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Land use, *Mapping, Surveys, Cities, Urbanization, Farms, Recreation, Data collections, Data processing.
Identifiers: *ERTS.

The success in the level of land-use identification results primarily from the various attributes of the ERTS system. These include the ability to provide repetitive coverage, and in particular seasonal coverage; the ability to image in four bands of the electromagnetic spectrum (green, red, and two near-infrared), which allows for manipulation of various combinations of bands; and the provision by the ERTS system of computer-compatible tapes for machine processing of data. ERTS can acquire land-use data for large areas in a short period of time. By the most conservative estimates, land-use mapping by satellite is cheaper by more than an order of magnitude over land-use mapping from conventional medium-altitude aerial photography. (See also W73-14126) (Knapp-USGS)
W73-14133

MINERAL RESOURCES, GEOLOGIC STRUCTURE, AND LANDFORM SURVEYS,
Cincinnati Univ., Ohio.
L. H. Lattman.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md, March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin. Goddard Space Flight Center Publication X-650-73-127, p 106-114, May 1973. 7 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Geologic mapping, *Monitoring, Surveys, Hazards, Data collections, Data processing, Mapping, Structural geology.
Identifiers: *ERTS.

The availability of ERTS imagery has broadened the scale of geological thinking to a more regional format than it has commonly had. ERTS has contributed significantly to the upgrading of geologic maps. The seasonal repetition of ERTS imagery is a tremendous advantage, because the presence or absence of vegetation has a real effect on ability to map geologic boundaries. In addition, light snow cover also aids geologic mapping by etching out microrelief, so that in the course of repetition those images which show slight snow cover are of real geologic value. The most striking features visible on ERTS imagery, which are difficult to map on ordinary photography, are regional lineaments, or linear patterns in the topography, which have been believed for some years to reflect major fracture zones extending upward from the basement of the earth. It had been previously postulated that such regional lineament patterns might localize ore deposits, the foci of earthquakes, and other geological hazards. The mapping of lineaments is done almost effortlessly on ERTS imagery. In monitoring geological hazards, the repetitive nature of ERTS is important. (See also W73-14126) (Knapp-USGS)
W73-14134

WATER RESOURCES,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
V. V. Salomonson, and A. Rango.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md, March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin. Goddard Space Flight Center Publication X-650-73-127, p 115-126, May 1973. 11 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Water resources, Surveys, Mapping, Telemetry, Data collections, Hydrologic data, Data processing, Surface waters, Groundwater, Wetlands, Glaciology, Turbidity, Snow cover, Floods.
Identifiers: *ERTS.

ERTS-1 data are used in flooded area mapping, snow cover measurements for runoff estimates, and the relay of hydrologic data taken over widely separated and remote regions. In addition, ERTS-1 provides much improved information on glacier characteristics, the areal extent of surface water and wetlands, and physiographic and land-use characteristics. Relative to previous data gathering systems--including remote sensing systems--ERTS-1 provides a much improved combination of repetitive coverage over wide areas coupled with high spatial resolution and concistent viewing perspective over several spectral intervals. (See also W73-14126) (Knapp-USGS)
W73-14135

THE EARTH RESOURCES PROGRAM OF THE CORPS OF ENGINEERS,
Corps of Engineers, Washington, D.C.
J. W. Jarman.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md, March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin. Goddard Space Flight Center Publication X-650-73-127, p 127-141, May 1973. 18 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Surveys, *Mapping, Monitoring, Land use, Reservoirs, Erosion, Dams, Reservoirs, Sedimentation, Wetlands, Water pollution, Data collections, Data processing.
Identifiers: *ERTS, *Army Corps of Engineers.

The Corps of Engineers is involved in the transfer of technology learned from experimental programs like ERTS-1 to operational applications. Remote sensing technology can become a major supporting tool in accomplishing the Army Engineers' civil mission. In Alaska the Cold Regions Research and Engineering Lab is doing research which includes geologic analysis. ERTS imagery can identify topographic information such as bedding planes, glacial features, and permafrost regions. For flood control studies, ERTS has data collection platform (telemetry) capabilities. ERTS imagery is used in an operation program for inspection of dams on bodies of water as small as 10 acres. Bands 5 and Band 7 show depth or turbidity of reservoirs. (See also W73-14126) (Knapp-USGS)
W73-14136

APPLICATION OF ERTS-1 DATA TO AID I SOLVING WATER RESOURCES MANAGE MENT PROBLEMS IN THE STATE O CALIFORNIA,
California Univ., Davis.
R. H Burgy
In: Symposium on Significant Results Obtaine from Earth Resources Technology Satellite-Greenbelt, Md, March 5-9, 1973: Vol II, Summar of Results, National Aeronautics and Space Ac min, Goddard Space Flight Center Publicatio X650-73-127, p 151-166, May 1973. 14 fig

Descriptors: *Remote sensing, *Satellites (Artif cial), *Water resources, Water management (Ap plied), *California, Data collections, Hydrologi data, Mapping, Surveys, Monitoring, Turbidity Eutrophication, Snow cover, Irrigation, Reser voirs, Cities.
Identifiers: *ERTS.

Investigations within the State of California hav emphasized the direct utilization of the supple mental data source afforded by the Eart Resources Technology Satellite-1 (ERTS-1 imagery. A user-oriented study has been underwa for several years to identify and develop applica tion methodology for remotely sensed informa tion. This satellite provides a synoptic leve coverage of study areas in California on a repeti tive cycle of 18 days. A series of test areas hav been selected in Central California within the re gion designated as the San Francisco Bay an Sacramento-San Joaquin River Delta Test Site The test area includes mountain watersheds foothill valley basins; snowpack regions; larg river systems; floodwater control facilities; deltai areas; agricultural lands, both irrigated and nonir rigated; dams and reservoirs operated for multipl purposes including water supply, flood control an recreation; urban areas; and lakes, both eutrophi and oligotrophic. ERTS-1 provides the synopti coverage of the earth needed for regional wate resources planning and operations. The imagery i directly applicable for water resources an hydrologic interpretations. The spectral range (bands) provided are directly useful for both qualitative and quantitative evaluation of water-re lated parameters. The sequential coverage pro vides the capability to assess and quantify seasonal changes, specific responses, and changes on watersheds in both large and relatively smal water system components. The potential applica tions and the data quantification capabilities of ERTS-1 image analysis are extremely broad scoped. Enhancement techniques becoming available will make the imagery adaptable for many additional uses. (See also W73-14126) (K napp-USGS)
W73-14137

APPLICATION OF ERTS RESULTS TO LAND AND RESOURCE MANAGEMENT IN THE STATE OF MISSISSIPPI,
Mississippi Office of Science and Technology, Jackson.
P. T. Bankston.
In: Symposium on Significant Results Obtained from Earth Resources Technology Satellite-1; Greenbelt, Md, March 5-9, 1973: Vol II, Summary of Results, National Aeronautics and Space Admin. Goddard Space Flight Center Publication X-650-73-127, p 167-181, May 1973. 10 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Mapping, *Land use, *Mississippi, Data collections, Data processing, Management, Planning.
Identifiers: *ERTS.

ERTS can be useful to the states in planning, resources management, and other important ways. The ERTS photomosaic of the State of Mississippi may be used to illustrate Mississippi's needs, which are similar to those of many other states. The technique of land-use mapping using ERTS data was found to be highly cost effective--ap-

roximately one-fifth the cost and the time equired using photography--requiring but a few onths to complete compared to approximately ree years for the same area using more conven-onal technology. Aimed primarily at producing a ate-wide land-use map, the availability of the nagery makes possible a number of other uses nd other derivative products, including forest pe maps, wildlife habitat maps, and other source management tools. These tools are ex-ected to be of particular importance and utility in e development of Mississippi's Coastal Zone anagement Program and state-wide land-use pol-y development. (See also W73-14126) (Knapp-SGS)
73-14138

EGETATION MAP OF SOUTHERN PARTS OF UBAREAS A AND C, BIG CYPRESS SWAMP, LORIDA,
eological Survey, Washington, D.C.
or primary bibliographic entry see Field 07C.
73-14155

NVESTIGATION OF ENVIRONMENTAL IN-ICES FROM THE EARTH RESOURCES ECHNOLOGY SATELLITE, PR 568/MMC 200,
ITRE Corp., McLean, Va.
or primary bibliographic entry see Field 05A.
73-14162

RINITY BAY STUDY: DYE TRACING EX-ERIMENTS,
racor, Inc., Austin, Tex.
or primary bibliographic entry see Field 05B.
73-14164

IAJOR INORGANICS,
labama Univ., University.
or primary bibliographic entry see Field 05A.
73-14189

C. Evaluation, Processing and Publication

VATER RESOURCE OBSERVATORY WIND ND SOLAR RADIATION DATA-WATER EAR 1972,
Vyoming Univ., Laramie. Water Resources esearch Inst.
. E. Smith.
vailable from the National Technical Informa-on Service as PB-222 914, $3.50 in paper copy, 1.45 in microfiche. Water Resources Series No 6, June 1973. 61 p. OWRR A-010-WYO (1).

Descriptors: Winds, Data processing, *Wyoming, Anemometers, *Data collections, *Solar radiation.
Identifiers: *Wind data.

Wind data that have been reduced from recording nemometer charts and from readings of totalizing nemometers plus incident solar radiation data rom various stations operated by the University f Wyoming in and adjacent to Laramie, Wyom-ng, are presented in tabular form. The period overed is from October 1971 to October 1972.
W73-13660

TRUCTURAL AND STRATIGRAPHIC RAMEWORK, AND SPATIAL DISTRIBUTION OF PERMEABILITY OF THE ATLANTIC COASTAL PLAIN, NORTH CAROLINA TO NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-13666

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, OLD RIVER LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 08A.
W73-13678

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1969-SEPTEMBER 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02L.
W73-13679

FLOODS OF 1971 AND 1972 ON GLOVER CREEK AND LITTLE RIVER IN SOUTHEASTERN OKLAHOMA,
Geological Survey, Washington, D. C.
W. O. Thomas, Jr., and R. K. Corley.
Water Resources Investigation No 5-73, 1973. 2 sheets, 7 fig, 2 map, 1 tab, 3 ref.

Descriptors: *Floods, *Flood profiles, *Flood data, *Flood discharge, *Oklahoma, Streams, Flood peak, Curves, Maps, Streamflow, Flow rates, Hydrologic data, Data collections, Watershed management, Precipitation (Atmospheric), Runoff, Flood frequency.
Identifiers: *Glover Creek (Okla), *Little River (Okla).

Heavy rains of December 9-10, 1971, and Oct. 30-31, 1972, caused outstanding floods on Glover Creek and Little River in McCurtain County in southeastern Oklahoma. Hydrologic data are presented that document the extent of flooding, flood profiles, and frequency of flooding on reaches of both streams. The data provide a technical basis for formulating effective flood-plain zoning that will minimize existing and future flood problems. The report also can be useful for locating waste-disposal and water-treatment facilities, and for the development of recreational areas. The general procedure used in defining the flood boundaries was to construct the flood profiles from high-water marks obtained by field surveys and by records at three stream-gaging stations (two on Little River and one on Glover Creek). The extent of flooding was delineated on topographic maps by using the flood profiles to define the flood elevations at various points along the channel and locating the elevations on the map by interpolating between contours. In addition, flood boundaries were defined in places by field survey, aerial photographs, and information from local residents. The accuracy of the flood boundaries is consistent with the scale and contour interval of maps (1 inch±2,000 feet; contour interval 10 and 20 feet), which means the flood boundaries are drawn as accurately as possible on maps having 10- and 20-foot contour intervals. (Woodard-USGS)
W73-13680

MAPS SHOWING AREAS OF POTENTIAL INUNCATION BY TSUNAMIS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. R. Ritter, and W. R. Dupre.
Geological Survey Miscellaneous Field Studies MF 480, 1972. 2 sheets, 2 fig, 2 map, 8 ref.

Descriptors: *Tsunamis, *Ocean waves, *Floods, *Coasts, *California, Flood damage, Highways, Flood frequency, Maps, Saline water intrusion.
Identifiers: *San Francisco Bay Region (Calif), *Inundation areas (Tsunamis), Tsunamis runup.

Areas in the San Francisco Bay coastal region that might be inundated by tsunamis with a runup of 20 feet are shown on two maps (scale 1:125,000). The maps show places where highway traffic may be disrupted as a result of inundation or damage caused by a tsunami and may be used to suggest possible routes for detours. The delineations are generalized, but may be used as a guide for further detailed study prior to development of structures such as a nuclear reactor, where safety is critically important. Tsunamis, often incorrectly called tidal waves, are long period waves usually caused by underwater seismic disturbances, volcanic eruptions, or submerged landslides. Only 1 or 2 feet high as they speed across the Pacific Ocean at about 450 miles per hour, the tsunami waves may increase in height to tens of feet as they approach a coast. Runups along the shore of more than 50 feet by tsunamis are not uncommon, and destruction by such waves may reach catastrophic proportions. A tsunami having a wave height or runup of 20 feet may arrive at the Golden Gate once every 200 years. (Woodard-USGS)
W73-13682

WATER RESOURCE OBSERVATORY, WIND DATA, WATER YEARS 1970 AND 1971,
Wyoming Univ., Laramie. Water Resources Research Inst.
V. G. Smith.
Research Report, Water Resources Series No 31, July 1972. OWRR-A-001-WYO (61).

Descriptors: Winds, *Data collections, *Anemometers, Computer programs, *Wyoming, Data processing, *Climatic data, On-site data collections.
Identifiers: *Wind data.

Wind data that have been reduced from recording anemometer charts and from readings of totalizing anemometers are presented in tabular form.
W73-13714

ANALOG-MODEL STUDIES OF THE EFFECTS OF RECHARGE WELLS ALONG THE HOUSTON SHIP CHANNEL ON POTENTIOMETRIC SURFACES OF THE CHICOT AND EVANGELINE AQUIFERS, HOUSTON, TEXAS,
Geological Survey, Washington, D.C.
D. G. Jorgensen.
Open file report, 1973. 2 sheets, 4 fig, 1 tab.

Descriptors: *Groundwater recharge, *Aquifer characteristics, *Recharge wells, *Artificial recharge, *Analog models, Texas, Methodology, Water levels, Pumping, Withdrawal, Model studies, Hydrographs, Maps, Hydrologic data, Channels.
Identifiers: *Houston Ship Channel (Tex).

Because of increasing concern about the continuing decline of water levels in the Houston, Texas, area, an electric analog model was used to determine the effects on the potentiometric surfaces resulting from recharging water through wells along the Houston Ship Channel into the two major aquifers, the Chicot and Evangeline. The upper model layer simulated the hydrologic conditions in the lower unit of the Chicot aquifer undifferentiated. The simulation included clay compaction and vertical leakage as well as transmissivity and storage. The lower model layer simulated the hydrologic conditions in the Evangeline aquifer which underlies the Chicot aquifer. Fifteen hypothetical wells were modeled recharging the aquifers at 1,000 gpm each while concurrently increasing the annual groundwater pumping from the aquifers. The distribution of the water recharged to aquifers by wells is tabulated. Hydrographs show the simulated decline of the altitude of the potentiometric surface of the aquifers from 1890-1980. The simulated effect is shown on the potentiometric surface of the aquifers from recharging through the 15 wells during 1973-80. (Woodard-USGS)
W73-13762

STATUS AND TRENDS OF RESEARCH IN HYDROLOGY, 1965-74.
For primary bibliographic entry see Field 02A.
W73-13765

WORLD WATER BALANCE: REPORT OF PROGRESS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W73-13766

STATUS AND TRENDS IN HYDROLOGICAL FORECASTS: PART A, FORECASTING OF RUN-OFF, RIVER AND LAKE LEVEL, ICE CONDITIONS AND SURFACE-WATER TEMPERATURE,
For primary bibliographic entry see Field 02A.
W73-13769

NETWORK PLANNING AND DESIGN: PART A, REVIEW OF SCIENTIFIC APPROACHES AND PROBLEMS IN HYDROLOGICAL NETWORK DESIGN,
For primary bibliographic entry see Field 02A.
W73-13771

NETWORK PLANNING AND DESIGN: PART B, NETWORK DESIGN FOR OBSERVATION OF WATER QUALITY, SEDIMENT TRANSPORT, GROUND WATER, AND SOIL MOISTURE.
For primary bibliographic entry see Field 02A.
W73-13772

ECOLOGICAL EFFECTS OF STRIP MINING IN OHIO,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 05C.
W73-13780

A PHYSICS-BASED APPROACH TO HYDROLOGIC RESPONSE MODELING: PHASE II: APPLICATIONS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-13854

A MULTISECTORAL MODEL OF PACIFIC AND MOUNTAIN INTERSTATE TRADE FLOWS,
British Columbia Univ., Vancouver. School of Community and Regional Planning.
For primary bibliographic entry see Field 06A.
W73-13986

ARIZONA AGRI-FILE.
For primary bibliographic entry see Field 03F.
W73-14006

MINICOMPUTER FOR REGULATION AND CONTROL OF EFFLUENT DISCHARGES (MINIDATOR FOR STYRNING OCH KONTROLL AV AVLOPP),
For primary bibliographic entry see Field 05G.
W73-14022

DISC STORAGE FOR MINICOMPUTER APPLICATIONS,
S. Davis.
Computer Design, Vol 12, No 6, p 55-64, June 1973. 10 fig.

Descriptors: *Design, *Digital computers, Maintenance.
Identifiers: *Minicomputers, *Disk drives, Reliability.

Basic descriptions are given of disc drives, design tradeoffs, and performance and environmental limitations as well as a state of the art review of recent minidisc offerings to assist computer systems engineers in choosing and using modern disc drives as expanded minicomputer storage. (Little Battelle)
W73-14079

PREDICTING CROSSTALK IN DIGITAL SYSTEMS,
Honeywell Information Systems, Inc., Billerica, Mass.
J. A. DeFalco.
Computer Design, Vol 12, No 6, p 69-75, June 1973. 7 fig, 5 ref.

Descriptors: *Equations, *Data transmission, *Digital computers, Mathematical studies, Estimating, Electronic equipment
Identifiers: *Crosstalk.

Crosstalk, or coupling between transmission lines, is becoming an important factor in digital system design because of high transmission speeds. An engineering discussion of crosstalk is presented in terms of both its physical and mathematical developments under systems conditions. Equations are derived for predicting crosstalk, and curves of basic constants and a table of general waveforms enable the designer to rapidly quantify crosstalk in specific systems. (Little-Battelle)
W73-14080

A SIMPLE, OFF-LINE MASS SPECTRA DIGITIZER,
Technische Hogeschool, Eindhoven (Netherlands). Lab. of Instrumental Analysis.
J. G. Leferink, and P. A. Leclercq.
Analytical Chemistry, Vol 45, No 3, p 625-626, March 1973. 4 fig, 2 ref.

Descriptors: *Data transmission, *Laboratory equipment, *Fabrication, *Automatic control, Data collections, Instrumentation, Algorithms.
Identifiers: *Mass spectra, *Mass spectra digitizer.

An apparatus has been designed which reduces the time involved in manually measuring, writing, and punching data from a spectral chart to a simple, one-step action. The set-up described consists mainly of standard instruments to be found in an analytical laboratory. Paper tape is used as preferred over magnetic tape and cards, from a viewpoint of reliability and economics. Discussed are algorithms which assign the data obtained with this system to different arrays. By using the equipment described a saving of 70 percent in time can be achieved easily over manual methods for digitizing and punching mass spectral data. Because of the general design, the system is very versatile. The instruction-set can be changed and extended; only the software has to be adapted. If a card puncher is available, it can be substituted for the paper tape puncher. (Holoman-Battelle)
W73-14093

CATALOG OF RECHARGE BASINS ON LONG ISLAND, NEW YORK, IN 1969,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 04B.
W73-14103

OPEN-FILE MAPS SHOWING ALTITUDES IN SHALLOW GRAVEL AQUIFERS IN MARCH 1973, IN COLUMBIA BASIN IRRIGATION PROJECT AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
H. H. Tanaka, and W. E. Lum.
Open-file maps, 1973. 2 sheets, 2 maps.

Descriptors: *Groundwater resources, *Irrigation, *Water levels, *Columbia River, *Washington, Aquifers, Mapping, Contours, Water wells, Maps.
Identifiers: *Columbia River Basin Irrigation Project.

A contour map, scale 2 miles to the inch, shows the water-level altitude in (1) sedimentary and shallow basalt aquifers, and (2) deeper basalt aquifers for March 1973 in the Columbia River Basin Irrigation Project area, Washington. Water-level altitude is expressed in feet above mean sea level. Symbols indicate dry wells, where water level is below well bottom. (Woodard-USGS)
W73-14108

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04C.
W73-14111

HYDROGEOLOGIC DATA FOR THE QUINNIPIAC RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
D. L. Mazzaferro.
Connecticut Water Resources Bulletin No 26, 1973. 54 p, 1 fig, 1 plate, 6 tab, 10 ref.

Descriptors: *Groundwater resources, *Water wells, *Water quality, *Well data, *Connecticut, Geology, Aquifer characteristics, Basic data collections, Test wells, Drillers logs, Maps, Mapping.
Identifiers: *Quinnipiac River Basin (Conn).

Geologic, groundwater, and quality-of-water data are presented for the groundwater part of a water-resources inventory of the Quinnipiac River basin, Connecticut. The study area is a 360-square-mile area in south-central Connecticut drained principally by the Quinnipiac River and its tributaries and several smaller streams which drain directly to Long Island Sound. The area includes all or parts of the following towns: Ansonia, Berlin, Bethany, Branford, Bristol, Cheshire, Derby, Durham, East Haven, Farmington, Guilford, Hamden, Meriden, Middlefield, Middletown, Milford, New Britain, New Haven, North Branford, North Haven, Orange, Plainville, Prospect, Southington, Wallingford, West Haven, Wolcott, and Woodbridge. Data collected for this investigation from July 1969 to December 1971 were supplemented by data collected during previous investigations. Old but previously unpublished analyses of water are tabulated from wells in New Haven collected primarily from 1938 to 1949. (Woodard-USGS)
W73-14112

WATER RESOURCES OF THE YELLOWSTONE RIVER VALLEY, BILLINGS TO PARK CITY, MONTANA,
Geological Survey, Washington, D.C.
A. W. Gosling, and E. F. Pashley, Jr.
Hydrologic Investigations Atlas HA-454, 2 sheets, 1973. 7 fig, 2 map, 20 ref.

Descriptors: *Water resources, *River basins, *Valleys, *Water quality, *Montana, Geology, Surface waters, Groundwater, Water yield, Water utilization, Chemical analysis, Hydrologic data, Streamflow, Runoff, Flow rates, Aquifer characteristics, Hydrologic budget, Irrigation water, Industrial water, Municipal water, Water supply, Projections, Human population, Maps, Hydrographs.
Identifiers: *Yellowstone River Valley (Mont).

This 2-sheet atlas describes the water resources of the Yellowstone River valley from Park City to Billings, Montana, with particular emphasis on the adequacy and suitability of the water supply for the projected growth of the greater Billings area. The largest quantity of good quality groundwater in the study area is found in the unconsolidated deposits. Wells drilled into the Cretaceous rocks yield only small quantities of poor quality water,

except for the Judith River Formation and the Eagle Sandstone, which yield small quantities of water of fair quality. The annual water requirement of water users ranges from 200,000 to almost 400,000 acre-feet per year. Agricultural consumption is 180,000 to 360,000 acre-feet per year, municipal consumption is about 20,000 acre-feet per year, and industrial and commercial consumption is about 5,000 acre-feet per year. The Yellowstone River supplies about 98% of water used; the remaining 2% is supplied from groundwater. Billings is growing steadily and the population may exceed 100,000 in the 1980's. The water requirement of the city is not expected to rise above 30,000 acre-feet per year in the foreseeable future. (Woodard-USGS)
W73-14115

GROUND-WATER RESOURCES OF THE ASHUELOT RIVER BASIN, SOUTHWESTERN NEW HAMPSHIRE,
Geological Survey, Washington, D.C.
H. A. Whitcomb.
For sale by USGS, Washington, D.C., 20242, Price $1.00 per set. Hydrologic Investigations Atlas HA-441, 2 sheets, 1973. 13 fig, 1 map, 3 tab, 10 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water quality, *New Hampshire, Water yield, Water supply, Water utilization, Hydrologic data, Geology, Water analysis, Chemical analysis, Water levels, Well data, Maps, Hydrographs.
Identifiers: *Ashuelot River basin (NH).

The purpose was to obtain information on the quantity and quality of water being used in the Ashuelot River basin in New Hampshire to determine the potential for development of additional groundwater resources. This 2-sheet atlas is intended to provide information to guide water planners in the development of water supplies to meet future needs in southwestern New Hampshire. Groundwater in the basin is normally low in dissolved solids, characteristically soft, and suitable for most domestic and industrial uses without special treatment. The yield reported by drillers of 52 wells completed in bedrock ranges from less than 1 gpm to 32 gpm and averages about 9 gpm. About 90% of the wells yield adequate supplies for normal domestic needs (2 gpm or more). The depth of penetration in bedrock ranges from about 12 to 387 feet, and the average is 127 feet. Only about 5% of the wells are more than 300 feet deep, which is generally considered to be the depth beyond which the chance of intercepting water-bearing joints and other fractures is sufficiently small not to warrant deeper drilling. (Woodard-USGS)
W73-14116

SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM EARTH RESOURCES TECHNOLOGY SATELLITE-1, MARCH 5-9, 1973, VOLUME II SUMMARY OF RESULTS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-14126

REVIEW OF ERTS-1 STATUS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-14127

IDENTIFICATION AND MAPPING OF SOILS, VEGETATION, AND WATER RESOURCES OF LYNN COUNTY, TEXAS, BY COMPUTER ANALYSIS OF ERTS MSS DATA,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 07B.
W73-14128

PRELIMINARY GEOLOGIC APPLICATION OF ERTS-1 IMAGERY IN ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-14129

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
For primary bibliographic entry see Field 07B.
W73-14130

APPLICATION OF ERTS-1 IMAGERY TO FLOOD INUNDATION MAPPING,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 07B.
W73-14131

LAND USE AND MAPPING,
Dartmouth Coll., Hanover, N.H.
For primary bibliographic entry see Field 07B.
W73-14133

MINERAL RESOURCES, GEOLOGIC STRUCTURE, AND LANDFORM SURVEYS,
Cincinnati Univ., Ohio.
For primary bibliographic entry see Field 07B.
W73-14134

WATER RESOURCES,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-14135

THE EARTH RESOURCES PROGRAM OF THE CORPS OF ENGINEERS,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-14136

APPLICATION OF ERTS-1 DATA TO AID IN SOLVING WATER RESOURCES MANAGEMENT PROBLEMS IN THE STATE OF CALIFORNIA,
California Univ., Davis.
For primary bibliographic entry see Field 07B.
W73-14137

APPLICATION OF ERTS RESULTS TO LAND AND RESOURCE MANAGEMENT IN THE STATE OF MISSISSIPPI,
Mississippi Office of Science and Technology, Jackson.
For primary bibliographic entry see Field 07B.
W73-14138

METHODS OF CALCULATING PARAMETERS OF TURBIDITY CURRENTS (O METODAKH RASCHETA PARAMETROV SUSPENZIONNYKH POTOKOV),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02E.
W73-14140

MATHEMATICAL MODELING OF STREAMFLOW (MATEMATICHESKOYE MODELIROVANIYE RECHNOGO STOKA),
For primary bibliographic entry see Field 02A.
W73-14142

A HYDROLOGIC DESCRIPTION OF LAKE MINNEHAHA AT CLERMONT, FLORIDA,
Geological Survey, Winter Park, Fla.
P. W. Bush.
Florida Bureau of Geology Map Series No 54, 1972. 1 sheet, 10 fig, 1 map, 2 tab.

Descriptors: *Lakes, *Lake morphology, *Hydrologic data, *Water quality, *Florida, Geology, Rainfall, Water level fluctuations, Hydrology, Chemical analysis, Maps, Hydrographs, Groundwater movement, Water table.
Identifiers: *Lake Minnehaha (Fla), Hydrologic balance.

Lake Minnehaha is in south-central Lake County, a predominantly rural area in the heart of Florida's citrus belt. The 3.77 square-mile lake is bounded on three sides by citrus groves, with homes scattered among the trees along the shoreline. The city of Clermont borders the lake along its north shore. The formation of Lake Minnehaha and other lakes in the area is apparently due to localized differential solution of the underlying limestone by percolating groundwater, and corresponding subsidence of the surface, thus creating depressions which evolved into lakes. Since May 1945, the stage of Lake Minnehaha has fluctuated between 99.0 feet above mean sea level on April 5, 1960, and 92.7 feet above mean sea level on January 22, 1963. The stage of Lake Minnehaha has been regulated to some degree since 1956 by a discharge control structure at the outlet from Cherry Lake, about 8.6 miles downstream of the outlet from Lake Minnehaha. The quality of water in Lake Minnehaha is good, and presently appears to be stable. Comparisons of the chemical analysis of lake water sampled in March 1972 with previous analyses as far back as 1956 indicates no significant changes in concentration of any constituent for which analyses are available. (Woodard-USGS)
W73-14150

GEOLOGY AND EARTH RESOURCES OF OKLAHOMA,
Geological Survey, Norma, Okla.
K. S. Johnson, C. C. Branson, N. M. Curtis, Jr., W. E. Ham, and M. V. Marcher.
Educational Publication 1, 1972. 8 p, 7 map, 1 tab.

Descriptors: *Water resources, *Geology, *Groundwater resources, *Water quality, *Oklahoma, Surface waters, Streamflow, Aquifer characteristics, Water yield, Maps, Topography, Geomorphology, Physiographic provinces, Mineralogy, Oil fields, Lakes, Reservoirs.

This atlas of maps and cross sections describes geology and earth resources for Oklahoma. Rocks of every geologic period crop out in Oklahoma. Although most of these rocks are of sedimentary origin, consolidated from sediments deposited during the Paleozoic Era, the oldest are Precambrian granites and rhyolities formed 1.05 to 1.35 billion years ago. Average annual precipitation ranges from about 16 inches in the western Panhandle to as much as 56 inches in the southeastern part of the State. Major groundwater aquifers are stream deposits (alluvium, terrace deposits, and the Ogallala Formation), limestone, sandstone, and gypsum. These aquifers are estimated to contain more than 300 million acre-feet of water. The entire State is drained by the Arkansas and Red Rivers and their tributaries. Each year approximately 13 million acre-feet of water flows into the State through these streams, 22 million acre-feet is added by precipitation, and 35 million acre-feet flows out. The mineral content of groundwater from stream deposits, limestone, and sandstone is typically low to moderate, and the water is suitable for most purposes. Highly mineralized water, unfit for nearly any use, is present beneath freshwater in all parts of the State. (Woodard-USGS)
W73-14153

FLOODS IN BIG ROCK QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
R. T. Mycyk, G. L. Walter, and B. L. McDonald.

For salt by USGS, Washington, D.C. 20242, Price $0.75 cents. Hydrologic Investigations Atlas HA-472, 1973. 1 sheet, 10 fig, 2 tab, 2 ref.

Descriptors: *Floods, *Flood data, *Flood frequency, *Flood profiles, *Illinois, Maps, Hydrographs, Hydrologic data, Streamflow, Crest-stage gages, Water resources development, Flood control, Flood plains.
Identifiers: *Big Rock Creek (Ill).

This one-sheet atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Big Rock quadrangle, northeastern Illinois. It should aid in solving existing flood problems and formulating effective flood-plain regulations that will minimize the creation of new flood problems. The data will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to the groundwater resources. The approximate areas inundated by floods along streams in the Big Rock quadrangle are delineated on a topographic map. In addition to other illustrated data, flood profiles are shown for the October 1954 and February 1966 floods for Big Rock Creek, West Branch Big Rock Creek, East Branch Big Rock Creek, Youngs Creek, and Welch Creek; they are shown for October 1954 only for Welch Creek. (Woodard-USGS)
W73-14154

VEGETATION MAP OF SOUTHERN PARTS OF SUBAREAS A AND C, BIG CYPRESS SWAMP, FLORIDA,
Geological Survey, Washington, D.C.
B. F. McPherson.
For sale by USGS, Washington, D.C. 20244, Price $0.75. Hydrologic Investigations Atlas HA-492, 1973. 1 sheet, 1 map.

Descriptors: *Vegetation, *Swamps, *Florida, Maps, Aerial photography, Remote sensing, Forests, Marshes, Pine trees, Mapping, Coastal marshes.
Identifiers: *Big Cypress Swamp (Fla), Pine forest, Hammock forest, Cypress forest.

This map showing vegetation of southern parts of Big Cypress Swamp, Florida, was made with the aid of aerial photography in conjunction with ground surveys. The basic photography used was infrared black and white taken in December 1969 at 15,000 feet (1:30,000 scale). This photography was particularly useful in delineating areas of different water depths, which, in turn, facilitated the separation of major plant associations such as deep water sloughs and marshes from relatively drier prairies. Higher elevation photography (1971) both black and white (24,000 feet) and color infrared (29,000 feet) was used to delineate large vegetal features, such as strands or coastal forests. Various colors on the map show pine forest; hammock forest, cypress forest; mixed pine and cypress forest; mixed swamp forest; coastal forest, prairies; inland marshes, slough, and ponds; coastal marshes; and saltwater prairies or marshes. (Woodard-USGS)
W73-14155

WATER AVAILABILITY, CLAY COUNTY, ALABAMA,
Geological Survey, University, Ala.
R. C. Chandler, G. C. Lines, and J. C. Scott.
Alabama Geological Survey Map 103, 1972. 22 p, 3 fig, 1 map, 3 tab, 17 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Alabama, Hydrogeology, Hydrologic data, Data collections, Geology, Streamflow, Flow rates, Aquifer characteristics, Water wells, Water yield, Hydrologic budget, Groundwater movement, Water utilization, Chemical analysis.
Identifiers: *Clay County (Alabama).

Total water use in Clay County, Alabama, in 1968 was estimated to be about 1 mgd, which is only a small fraction of the water available for use. Surface water supplies of 10 mgd or more are available without storage from the lower reaches of Enitachopco Creek, and supplies of 2 mgd or more are available without storage from the lower reaches of Hatchet, Little Hillabee, Crooked, Fox, Ketchepedrakee, and Talladega Creeks. Surface water stored in lakes and farm ponds in the county is estimated to be 950 million gallons. The largest source of groundwater in the county is in fractures in quartz-mica schist. Wells tapping these rocks in the central part of the county commonly yield from 25 to 50 gpm, and some may yield as much as 350 gpm. Wells in other parts of the county generally yield less than 25 gpm, but most wells yield sufficient water for domestic and stock supplies. Water in the county is generally low in dissolved minerals and is suitable for most uses. Surface water generally contains less than 50 mg/liter dissolved solids, and groundwater less than 100 mg/liter dissolved solids. (Woodard-USGS)
W73-14156

WATER RESOURCES OF THE UPPER WABASH RIVER BASIN, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.
C. H. Tate, L. G. Davis, L. E. Johnson, and R. A. Pettijohn.
For sale by USGS, Washington, D.C., Price $1.25 per set. Hydrologic Investigations Atlas HA-433, 3 sheets, 1973. 11 map, 16 ref.

Descriptors: *Water resources, *Groundwater resources, *Surface waters, *Water quality, *Indiana, Water supply, Water utilization, Water storage, Reservoirs, Chemical analysis, Aquifer characteristics, Water wells, Water yield, Geology, Precipitation (Atmospheric), Hydrologic data, Maps, Hydrographs, Planning, Water resources development.
Identifiers: *Upper Wabash River basin (Ind).

This 3-sheet atlas describes streamflow characteristics, groundwater availability and the quality of water in the upper Wabash River basin in Northwestern Indiana. The presentation is a regional appraisal of the water resources and is intended to provide a base for planning purposes. The population of this part of the basin is approximately 360,000. The economy of the region is primarily agricultural; however, manufacturing is of major importance. Water supplies in the basin are obtained primarily from groundwater sources, and the use is fairly evenly distributed among three major categories: rural, commercial and domestic, and industrial. The use in the basin amounts to approximately 14,000 gpd per square mile. The use in Grant County, the most highly industrialized area, is 30,400 gpd per square mile. Water supplies have increased more than 25% since 1959, and during the same period, the population has increased less than 5%. Groundwater is very hard, greater than 300 mg/liter hardness, with the predominant cations, calcium and magnesium, being associated with the anions of bicarbonate and sulfate. Surface water is generally similar in chemical composition to that of groundwater but tends to be less mineralized and more variable. (Woodard-USGS)
W73-14157

GEOLOGY OF MONROE COUNTY, ALABAMA,
Geological Survey, University, Ala.
J. C. Scott.
Alabama Geological Survey Map 101, 1972. 12 p, 4 fig, 1 map, 7 ref.

Descriptors: *Geologic, Geological surveys, *Geologic mapping, *Natural resources, *Alabama, Geologic investigations, Geomorphology, Geologic formations, Geologic time, Water resources, Oil, Lignite, Limestones, Sands, Gravels, Groundwater resources.
Identifiers: *Monroe County (Alabama).

The orderly growth and economy of an area depend largely on the natural resources in or available to it. This geologic map shows the distribution of geologic units in Monroe County, Ala. and provides information that will aid in evaluating the occurrence and availability of water and other minerals that occure in them. The map was prepared by the U.S. Geological Survey, Water Resources Division, in cooperation with the Geological Survey of Alabama as a part of a comprehensive investigation of an eight county area in southwestern Alabama. Geologic units that crop out in Monroe County are of sedimentary origin and range in age from Eocene to Holocen. They consist mainly of gravel, sand, clay, sandstone, siltstone, claystone and limestone. Geologic units mapped in the county include, from oldest to youngest, the Nanafalia, Tuscahoma, Hatchetigbee, and Tallahatta Formations, and the Lisbon Formation and Gosport Sand undifferentiated, and the Jackson Group in the Eocene Series, the Oligocene Series undifferentiated, the Miocene Series undifferentiated; the Citronelle Formation in the Pliocene Series; and alluvium and terrace deposits in the Pleistocene and Holocene Series. The total thickness of Eocene and younger deposits ranges from 200 feet in the northeastern part of the country to 1,700 feet in the southwestern part. (Woodard-USGS)
W73-14158

SURFACE-WATER AVAILABILITY, FRANKLIN COUNTY, ALABAMA,
Geological Survey, University, Ala.
J. R. Harkins, D. M. O'Rear, and A. L. Knight.
Alabama Geological Survey Map 106, 1972. 11 p, 5 fig, 1 map, 1 tab, 13 ref.

Descriptors: *Water resources, *Surface waters, *Hydrologic data, *Alabama, *Water quality, Rainfall, Runoff, Streamflow, Flow rates, Water yield, Average flow, Low flow, High flow, Hydrologic budget, Water temperature, Chemical analysis, Data collections, Maps.
Identifiers: *Franklin County (Alabama).

Surface-water resources are described for Franklin County, in northwestern Alabama, in a manner that provides for a quick visual appraisal of surface water availability. The county has moderate relief and is drained primarily by Cedar and Bear Creeks. Streamflow varies considerably from one season to another. Highest monthly flows are 4 to 5 times greater than average monthly flows. Lowest monthly flows are only one-fourth to one-sixth of average flows. The average annual rainfall of 50 inches provides about 700 mgd of average runoff. The addition of 200 mgd via tributaries to Bear Creek results in a total average streamflow of 900 mgd which is about 300 times greater than actual water use in the county. Runoff from the county area is about 1.1 mgd per square mile. The water is streams generally is of a quality suitable for most uses. Cedar Creek, however, contains hard water (145 mg per liter) during periods of low flow. The temperature of water flowing in streams approximates the mean monthly air temperature and generally ranges from 3 deg C in January to 28 deg C during the summer. Temperatures of water from springs remain almost constant (15 to 17 deg C) throughout the year. (Woodard-USGS)
W73-14159

RECONNAISSANCE OF THE WATER RESOURCES OF THE TULSA QUADRANGLE, NORTHEASTERN OKLAHOMA,
Geological Survey, Oklahoma City, Okla.
M. V. Marcher, and R. H. Bingham.
Oklahoma Geological Survey Map HA-2, 4 sheets, 1971. 2 fig, 5 map, 4 tab, 20 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Oklahoma, Streamflow, Runoff, Precipitation (Atmospheric), Water supply, Water yield, Flow rates, Stream gages, Geology, Hydrologic data, Data collections, Aquifer characteristics, Chemical analysis, Water utilization.
Identifiers: *Tulsa area (Okla).

This 4-sheet atlas describes the water resources for the Tulsa, Oklahoma, area. Surface water is the major source of water used in the Tulsa quadrangle. The total amount of water used in 1968 is estimated at 25.4 billion gallons. Approximately 86% of this amount, or about 21.8 billion gallons, was taken from the lakes and rivers of the area; the remaining 3.6 billion gallons was provided by groundwater development. The major use of water was for municipal and industrial purposes, which accounted for about 24 billion gallons; rural domestic use accounted for the remaining 1.4 billion gallons. The most intensive area of groundwater development is in Ottawa County, where, in 1968, about 1.7 billion gallons was pumped from deep aquifers for municipal and industrial use. Because of the difficulty in obtaining sufficient water of good quality in many parts of the area, 33 rural water districts had been established by the end of 1967. These districts supplied an estimated 0.2 billion gallons of water to approximately 15,000 people; all the water was taken from surface-water sources. (Woodard-USGS)
W73-14160

INVESTIGATION OF ENVIRONMENTAL INDICES FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE, PR 568/MMC 200,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 05A.
W73-14162

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL III.
For primary bibliographic entry see Field 06A.
W73-14166

COMPARISON OF STATISTICAL AND DETERMINISTIC APPROACHES IN THE DETERMINATION OF HYDROLOGICAL PARAMETERS OF AQUIFERS,
Bundesanstalt fuer Bodenforschung, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 02F.
W73-14171

DESIGNING RESERVOIR CONTROL POLICIES WITH CHANCE CONSTRAINED PROGRAMMING,
London Graduate School of Business Studies (England).
For primary bibliographic entry see Field 06A.
W73-14175

INTUITION, POLICY AND MATHEMATICAL SIMULATION,
British Columbia Univ., Vancouver. Resource Science Center.
For primary bibliographic entry see Field 06A.
W73-14178

FIRST-ORDER ANALYSIS OF MODEL AND PARAMETER UNCERTAINTY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-14180

08. ENGINEERING WORKS

8A. Structures

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, OLD RIVER LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
W. C. Sherman, Jr., and C. C. Trahan.
Available from NTIS, Springfield, Va. 22151 as AD-756 126 Price $3.00 printed copy; $1.45 microfiche. Technical Report S-72-10, June 1972. 224 p, 69 fig, 68 plate, 19 tab, 18 ref.

Descriptors: *Engineering structures, *Locks, *Design criteria, *Structural analysis, Navigation, *Mississippi River, Structural design, Settlement (Structural), Hydrostatic pressure, Fluid mechanics, Stress analysis, Strain, Foundations.
Identifiers: *Old River Lock (Mississippi River).

Old River Lock is a reinforced concrete U-frame structure located on the west bank of the Mississippi River about 300 miles above the Head of Passes. The structure was founded at a depth of 71 ft on alluvial sands of an abandoned channel deposit that extends in depth to 95 ft below the base of the structure. Old River Lock was instrumented to obtain data for use in future analysis and design of similar structures and to determine the validity of certain assumptions and procedures used to design the lock. The program included the measurement of earth and hydrostatic pressures beneath the base slab and along the walls of the lock and the measurement of stresses and strains within the base slab and walls of the lock. Hydrostatic pressures were measured with piezometers. Soil pressures on the structure and stresses and strains within the structure were measured by electrical measuring devices. Settlement of the lock was determined from observations of settlement reference points, bolts, and plates at various locations in the lock. Deflections of the walls were determined by means of wall deflection pipes and a deflectometer. (Woodard-USGS)
W73-13678

MODEL TEST OF BOX INLET DROP SPILLWAY AND STILLING BASIN PROPOSED FOR TILLATOBA CREEK, TALLAHATCHIE COUNTY, MISS.,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 08B.
W73-13781

BOOMER CREEK CHANNEL IMPROVEMENT (LOCAL FLOOD PROTECTION PROJECT), STILLWATER, OKLAHOMA, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W73-13861

THE ROLE OF THE UNITED STATES ARMY CORPS OF ENGINEERS IN WATER MANAGEMENT,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13921

INSTITUTIONAL IMPLICATIONS OF U.S. DEEPWATER PORT DEVELOPMENT FOR CRUDE OIL IMPORTS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
M. R. Brant, B. L. Gladieux, H. G. Knight, J. C. Ulin, and R. E. Brown.
Available from the National Technical Information Service, $3.00 in paper copy, $1.45 in microfiche. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, Final IWR Report 73-4, June 1973. 178 p, 98 ref.

Descriptors: Institutions, *Institutional constraints, Legal aspects, *Jurisdiction, *Regulation, Ownership, Financing, Economic analysis, *Environmental control, Oil industry, Harbors, Planning, Construction, Operations, Administration, Control, Attitudes.
Identifiers: *Public interests, *Oil imports, *Deepwater Port development.

This report provides an overall appraisal of the institutional problems associates with the planning, construction, and operation of deep draft port facilities in the U.S. and adjacent waters for the reception and transshipment of imported crude petroleum. It defines the public interest in such ports; the characteristics which distinguish such ports from conventional ports; problems of legal jurisdiction as among international, Federal, State, and local levels; and the political setting within which deepwater crude petroleum ports is being considered, including public attitudes and policies at the State and local level. It analyzes problems of finance, ownership, and economic regulation; and functional characteristics and relationships of Federal departments and agencies, and State and local governments, pertaining to planning, permitting, and regulation of deepwater ports and related land-side developments. It makes recommendations with respect to required Federal legislation and organization, and institutional arrangements for public participation and intergovernmental relations. (IWR)
W73-13987

ANALYSIS OF COAL REFUSE DAM FAILURE, MIDDLE FORK BUFFALO CREEK, SAUNDERS, WEST VIRGINIA.
Wahler (W. A.) and Associates, Palo Alto, Calif.

Available from NTIS, Springfield, Va 22151 as PB-215 142, Price $6.75 printed copy; $1.45 microfiche. Contract report, February 1973 (Vol 1 of 2 volumes). 109 p, 80 fig, 6 tab, 28 ref. USBM Contract S0122084.

Descriptors: *Dam failure, *Coal mine wastes, *Flood damage, *West Virginia, Disasters, Foundation investigations, Drilling, On-site tests, Exploration, Surveys, Geology, Structural engineering, Engineering personnel, Data collections, Aerial photography, Evaluation, Floods.
Identifiers: *Buffalo Creek (W Va), *Saunders (W Va), Coal refuse dam.

On February 26, 1972, a coal refuse dam, owned and operated by the Buffalo Mining Company, failed near Saunders, W. Va. The resulting flooding of the Buffalo Creek Valley had national ramifications. The immediate consequences of the flooding were the deaths of 118 persons plus 7 reported missing, the loss of over 500 homes, and extensive flood damage to other property in Buffalo Creek Valley. Several investigations were started immediately after the disaster. They relied primarily on personal observations, and eyewitness reports, although the U.S. Army Corps of Engineers and the U.S. Geological Survey undertook limited field and laboratory testing. These original investigations contributed to an understanding of the Buffalo Creek Flood. This study presents a comprehensive view of the failure with essential data integrated from many sources, and an analysis of the failure based on a thorough program of subsurface exploration and sampling, field and laboratory testing, and engineering analyses. (Woodard-USGS)
W73-14163

UNCERTAINTIES RESULTING FROM MAN-MADE STRUCTURES,
R. L. A. de Jong.
In: Proceedings (Vol. III), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, Dec. 11-14, 1972. p 1070-1080, (1972). 9 ref.

Descriptors: Water resources, *Structures, *Storage, *Reservoirs, *Flood frequency, Curves, Reliability, Natural streams, Discharge (Water), Decision making, Downstream, Flood plains, Hydrology, Watersheds (Basins), Dams, *Risks.

The occurrence of extreme hydrologic events on streams in their natural state can usually be described in commonly-accepted statistical terms. However, the construction of storage reservoirs interferes with the reliability of the flood-frequency curves thus derived. The modifications resulting from this interference fall into one or more of the following categories: (1) floods of small magnitude and high frequency are eliminated or reduced since all, or most, of the floodwaters are stored in the reservoir; (2) intermediate size floods are passed on downstream with little or no reduction in volume, but the flood peaks are substantially reduced by the damping effect of the reservoir, possibly with some storage; and (3) events of extremely low frequency and corresponding large magnitude may actually be increased in severity if and when the impounding structure appears to be incapable of storing and/or safely discharging the flood waters. The mechanism involved in the third category depends on three types of uncertainties, and an attempt is made to put those components in proper perspective to arrive at a strategy for decision-making related to development of downstream flood plains. Threat of catastrophic events associated with water resources structures is of particular significance in view of increasing popularity of flood-plain insurance programs. (See also W73-14166) (Bell-Cornell)
W73-14174

8B. Hydraulics

FLOW AUGMENTING EFFECTS OF ADDITIVES ON OPEN CHANNEL FLOWS,
Columbia Research Corp., Gaithersburg, Md.
For primary bibliographic entry see Field 05G.
W73-13664

STUDY OF WIND-INDUCED TIDAL OSCILLATIONS OF SEA AND RESERVOIR SURFACES,
For primary bibliographic entry see Field 02H.
W73-13692

A CASE OF PLANNED PERCOLATION OF LIQUID FROM TWO PARALLEL CHANNELS,
Kiev State Univ. (USSR).
G. E. Mistetskii.
Fluid Mechanics--Soviet Research, Vol 2, No 2, p 18-23, March-April 1973. 2 fig, 6 ref.

Descriptors: *Fluid mechanics, *Flow, *Percolation, *Channels, Drains, Mapping, Mathematics, Equations.
Identifiers: USSR.

A solution is presented to the problem of systematic steady-state percolation of heavy, incompressible fluid from parallel channels to a noncontinuous, ideal drain. A characteristic function is found for percolation flow using the method of sequential conformal mapping. A special case of the arrangement when the drain is midway between channels is considered. A complex percolation potential is found, and numerical examples are given. (Josefson-USGS)
W73-13694

INTERACTION AND THE SUSPENSION OF COARSE PARTICLES IN A HIGH-CONCENTRATION FLOW,
Yu. N. Krivenko.
Fluid Mecahnics--Soviet Research, Vol 2, No 2, p 7-17, March-April 1973. 4 fig, 13 ref

Descriptors: *Fluid mechanics, *Flow, *Coarse sediments, *Suspension, Settling velocity, Equations.
Identifiers: USSR.

The mechanism of suspension of discrete particles in high-concentration flows is considered. Analysis of the interaction of solid particles in a two-phase, high-concentration flow reveals that the forces generated at the instant of particle collisions with one another or with the wall are many times the weight of particles and can result in their suspension in horizontal flow. The angular velocity produced in the collision of rigid particles and the flow of fluid around them can represent a source of suspension of coarse particles in upper, low-concentration layers of flow. (Josefson-USGS)
W73-13695

TSUNAMI WAVES (VOLNY TSUNAMI).
Sakhalin Kompleksnyi Nauchno-Issledovatelskii Institute, Yuzhno-Sakhalinsk (USSR).
For primary bibliographic entry see Field 02L.
W73-13751

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 1--REQUIREMENTS AND GENERAL PROCEDURES.
Hydrologic Engineering Center, Davis, Calif.

Available from NTIS, Springfield, Va., 22151 AD-758 904 Price $6.00 printed copy; $1.45 microfiche. Report HEC-IHD-100, (Vol 1), October 1971.

Descriptors: *Water resources development, Engineering, *International Hydrological Decade, *Hydraulic engineering, Methodology, Flood protection, Flood control, Reservoirs, Water supply, Hydroelectric power, Surface waters, Computer models, Computer programs.

This report is intended to respond to the need throughout the world for hydrologic engineering methods that can be applied in regions of sparse data. The report is to consist of 12 volumes, of which this is volume 1. It constitutes a contribution of the United States to the International Hydrological Decade (IHD). Procedures and methods that have been used successfully in Corps of Engineers studies or are believed to be of significant interest are described. Descriptions of computer programs and many recently developed techniques for use in hydrologic studies are included. (Woodard-USGS)
W73-13757

MODEL TEST OF BOX INLET DROP SPILLWAY AND STILLING BASIN PROPOSED FOR TILLATOBA CREEK, TALLAHATCHIE COUNTY, MISS.,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
F. W. Blaisdell.
Agricultural Research Service, United States Department of Agriculture, ARS-NC-3, January 1973, 50 p, 45 fig, 3 ref.

Descriptors: *Scour, *Riprap, *Drops (Structures), *Spillway crests, *Hydraulic design, *Discharge coefficients, *Stage-discharge relations, *Weirs, Channel erosion, Hydraulic structures, Bank stabilization, Spillways, Stilling basins, Energy dissipators, Hydraulic models, Open channels, Discharge (Water), Flow characteristics, Flow control, Tractive forces, Velocity, Dams, Manning formula, Tailwater, *Mississippi.

A hydraulic model was used to experimentally design the riprap in the approach and exit channels for a box inlet drop spillway and to develop a spillway crest to fit a predetermined head discharge relationship. Excessive scour in the approach channel near the structure was eliminated by adding riprap protection. Areas to be protected by each riprap size were determined from isovels measured in the approach channel. Sizes of riprap required to resist movement were based on the Manning formula. The dropdown of the overbank flow into the approach channel near the structure and the resulting erosion of the approach channel banks were eliminated by designing the trapezoidal weir box inlet crest so the head on the crest at bank-full discharge was equal to the depth of flow. Equations for the head-discharge relationship were derived. The computed and observed discharge coefficients were compared; the agreement was within 6 percent. The self formed shape of the sand-bed downstream channel was determined. Site requirements necessitated modifications of this shape. Experimental design methods were used to determine the placement and sizes of riprap required to protect the downstream channel. The effect of tailwater depths less than the design depth was shown to be minimal. (Dodge-ARS)
W73-13781

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE SURFACE REAERATION OF UNIFORM STREAMS,
Mississippi Univ. School of Engineering
For primary bibliographic entry see Field 02J.
W73-13817

PLUME TEMPERATURE MEASUREMENTS OF SHALLOW, SUBMERGED MODEL DISCHARGES WITH CURRENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg. National Thermal Pollution Research Program.
For primary bibliographic entry see Field 05B.
W73-13821

WAVE FORCES ON PILE INCLUDING DIFFRACTION AND VISCOUS EFFECTS,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
S. K. Chakrabarti.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY8, Paper 9935, p 1219-1233, August 1973. 5 fig, 10 ref, append.

Descriptors: *Waves (Water), *Piles (Foundations), *Coastal structures, *Refraction (Water waves), *Drag, Vortices, Unsteady flow, Fluid mechanics.
Identifiers: *Wave forces.

Linearized Navier-Stokes equations, including linear viscous terms, were used in an investigation of the oscillatory wave forces on a vertical circular cylindrical structure. Stokes' nonlinear gravity wave theory was applied to the analysis, and expressions for the wave pressures and forces on the cylinder were derived. The effect of diffraction of waves due to the presence of the cylindrical object is included in the derivation. The relative importance of the higher order terms in the nonlinear wave components and the viscous terms is shown. The theory is compared with test results on the inertia-predominant wave forces on a vertical cylindrical pile. (Knapp-USGS)
W73-13963

IRROTATIONAL FLOW WITH IRREGULAR BOUNDARY SHAPES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
A. G. Mercer.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY8, Paper 9937, p 1209-1217, August 1973. 2 fig, 1 tab, 7 ref, append.

Descriptors: *Uniform flow, *Computer programs, Finite element analysis, Flow nets, Mathematical models, Vortices, Hydrodynamics.

An algorithm for the numerical solution of two-dimensional irrotational flows based on an inverse transformation is presented as an efficient means of solving flows with irregular boundary shapes. Using the intersections of a set of streamlines and equipotential lines as computational nodal points, the algorithm determines the areas of high velocity flow so as to increase the accuracy in these areas. The algorithm is particularly well suited to modern high speed computers, and FORTRAN statements are given. Since the program operates on many different boundary shapes with no internal alterations, it is suitable for use by persons with limited background in numerical procedures. (Knapp-USGS)
W73-13964

MARGINAL ECONOMICS APPLIED TO PIPELINE DESIGN,
Toltz, King, Duvall, Anderson and Associates, St. Paul, Minn.
For primary bibliographic entry see Field 04A.
W73-13969

'HORIZONTAL' WELLS,
Arizona Univ., Tucson. Agricultural Extension Service.
For primary bibliographic entry see Field 04B.
W73-13997

PERIWINKLE CREEK RC AND D PROJECT MEASURE, UPPER WILLAMETTE RC AND D PROJECT, OREGON (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-14106

UNCERTAINTIES IN HYDRAULIC MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W73-14167

8D. Soil Mechanics

HAMLIN BEACH STATE PARK COOPERATIVE BEACH EROSION CONTROL PROJECT, LAKE ONTARIO, MONROE COUNTY, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer Districts, Buffalo, N.Y.

Available from NTIS, Springfield, Va. 22151 as EIS-NY-73-0088-F, Price $3.00 printed copy; $1.45 cents microfiche. July 3, 1972. 56 p, 1 plate, 7 tab.

Descriptors: *Beach erosion, *Erosion control, *Lake Ontario, *New York, Reviews, Evaluation, Recreation facilities, Engineering construction, Environmental effects, Wildlife conservation, Aesthetics, Social aspects, Economics.
Identifiers: *Hamling Beach State Park (N.Y.), *Environmental Impact Statements.

A review is presented of the documents concerning the proposed action and the views of other interested agencies and the concerned public relative to the various practicable alternatives in accomplishing the construction of a beach erosion control project at Hamlin Beach State Park, Lake Ontario, Monroe County, N.Y. The possible consequences of these alternatives were studied according to environmental, social well-being, and economic effects, including regional and national development, and engineering feasibility. (Woodard-USGS)
W73-13746

8G. Materials

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, OLD RIVER LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 08A.
W73-13678

INVESTIGATION OF SINKING METHODS FOR REMOVAL OF OIL POLLUTION FROM WATER SURFACES; REPORT 3. TESTS AND EVALUATION OF OIL SINKING MATERIALS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05G.
W73-13696

PH, ALKALINITY, AND CARBON DIOXIDE CONTENT OF BOILER WATER (EL PH, LA ALCALINIDAD Y EL ANHIDRIDO CARBONICO EN LAS AGUAS DE CALDERAS),
For primary bibliographic entry see Field 05D.
W73-14043

8I. Fisheries Engineering

THE EFFECTS OF WATER MANAGEMENT PRACTICES ON THE MOVEMENT OF LARGEMOUTH BASS,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 02I.
W73-13654

INTRODUCTION OF MYSIDACEA INTO PONDS AND CHECK-PONDS AS A METHOD OF INCREASING FISH PRODUCTIVITY, (IN RUSSIAN),
S. N. Ivanov.
Gidrobiol Zh. Vol 8, No 1, p 32-37, 1972. Illus. English summary.
Identifiers: Carp, Fish, Limnomysis-benedeni, Mesomysis-kowaleveskyi, Method, *Mysidacea, Ponds, Productivity.

Mesomysis kowaleveskyi Czern and Limnomysis benedeni Gzern. were introduced into annually drained carp ponds and check-ponds of the collective fishery from the Arakumian basins (basin of the Terek river). Mysidacea favored an increase in natural fish productivity of nursery and fattening ponds and check-ponds by 1.5-2 metric centners/ha.--Copyright 1972, Biological Abstracts, Inc.
W73-13712

ECOLOGICAL DIAGNOSES IN FOUR TROUT STREAMS IN NORMANDY, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France).
R. Cuinat.
Ann Hydrobiol. Vol 2, No 1, p 69-134, 1971. Illus. English summary.
Identifiers: Diagnoses, Ecological, France, Management, Normandy, Salmo-trutta, Streams, Trout.

Population density, individual growth, reproductive potential, age structures, migration and management of trout (Salmo trutta) populations in 4 stream areas in Seine-Maritime Normandy, are given. It is estimated that these streams could produce at least 100 kg trout/ha/yr or 4 times present yield if properly managed.--Copyright 1972, Biological Abstracts, Inc.
W73-13713

BIOGENIC ENRICHMENT OF SOCKEYE SALMON LAKES AND STOCK PRODUCTIVITY,
Washington Univ., Seattle. Coll., of Fisheries.
For primary bibliographic entry see Field 05C.
W73-13777

THE CULTURE AND METAMORPHOSIS OF THE TARPON, TARPON ATLANTICUS CUVIER AND VALENCIENNES,
G. Dahl.
Zool Revy, Vol 33, No 3/4, p 85-89, 1971, Illus, English summary.
Identifiers: Artemia-salina, *Culture, Elops-saurus, Food, *Metamorphosis, Protozoa, Rotatoria, *Tarpon, Tarpon-atlanticus.

On the north coast of Colombia, at the beginning of the rainy season in June 1964, large amounts of leptocephalus-larvae, of T. atlanticus were caught. They were migrating into brackish and freshwater wheer they underwent metamorphosis. In aquaria they survived in water ranging in salinity from nil to 3.6%. Most of the leptocephalus were T. atlanticus, but Elops saurus L. were also present. As fry, T. atlanticus 1st breathed air and ate Protozoa and Rotatoria. Then they took nauplius larvae of Artemia salina. Two weeks after metamorphosis they ate other small crustaceans. A month after metamorphosis they began eating other fish-fry. At the end of 1966 artificially bred specimens, 60-70 cm long, of this economically important species, which never before had been successfully cultured were ready to be released.--Copyright 1972, Biological Abstracts, Inc.
W73-13794

STUDY OF CERTAIN MERISTIC CHARACTERISTICS IN ALESTES BAREMOZE OF THE LOWER CHARI AND LAKE CHAD,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort Lamy (Chad).
For primary bibliographic entry see Field 02H.
W73-13798

BIOLOGICAL STUDIES ON THE FRESHWATER SHRIMPS IN KOREA: III. THE FOOD AND GROWTH OF THE LARVAE OF PALAEMON MODESTUS,
Pusan Fisheries Coll. (Republic of Korea).
For primary bibliographic entry see Field 02I.
W73-13799

FOOD HABITS AND GROWTH OF CHANNEL CATFISH FRY, ICTALURUS PUNCTATUS,
Iowa State Conservation Commission, Des Moines.
D. L. Bonneau, J. W. McGuire, O. W. Tiemeier, and C. W. Deyce.
Trans Am Fish Soc. Vol 101, No 4, p 613-619. 1972. Illus.
Identifiers: Algae, *Channel catfish, *Growth, *Food habits, Ictalurus-punctatus, Plankton, Zooplankton.

Polyethylene-lined rearing ponds were used in 1968 and 1969, in the study of effects of certain treatments on food habits and growth of young-of-the-year I. punctatus. Two ponds were used in 1968, and fed pond and a pond enriched with inorganic fertilizer. In 1969, the study was expanded to 4 ponds; 2 receiving treatments similar to those in 1968, a control pond, and a fed-and-enriched pond. Weekly samplings of fish, benthos, plankton, and water provided data for determining treatment effects. Enrichment with 2 inorganic fertilizers variously affected the algae, zooplankton, and benthic

communities. No significant difference was noted in the mean growth (weight and length) of fry in the fed pond and in the fed-and-enriched pond. Fish production and survival were not improved by enriching ponds. Feeding habits of young-of-the-year channel catfish varied with availability of food items. Analyses of stomach contents indicated that fry, after accepting supplemental feed, consumed many natural foods in direct proportion to their availability. Fry in continually fed ponds were approximately 5 wk old when they first accepted supplemental feed, which thereafter comprised most of the food they ate and was responsible for their consistent growth rate. The advantage of supplemental feed became especially apparent as the fry became larger and demand for food increased. In the absence of supplemental feed, nonavailability of adequate natural food limited growth.--Copyright 1973, Biological Abstracts, Inc.
W73-13855

THE DISTRIBUTION AND LIFE HISTORY OF SOUTH AMERICAN FRESHWATER CRABS (AEGLA) AND THEIR ROLE IN TROUT STREAMS AND LAKES,
California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
J. W. Burns.
Trans Am Fish Soc, Vol 101, No 4, p 595-607, 1972, Illus.
Identifiers: Aegla, *Argentina, California, *Chile, *Crabs (Freshwater), Distribution patterns, Insects, Lakes, Salmo-gairdneri, Salmo-trutta, Streams, *Trout diets.

Freshwater crabs (Aegla) were collected in Chile and Argentina in 1971, and shipped to California, for laboratory observations to determine the desirability of introducing them into California as forage for trout. Stomachs and scales taken from Chilean trout were examined to determine the importance of Aegla in the diet and growth of trout. Aegla made up 66% of the dry weight of the identifiable stomach contents of river-dwelling rainbow trout (Salmo gairdneri) and 67% of the stomach contents of river-dwelling brown trout (S. trutta). However, they were not as important as fish in the diets of lake-dwelling trout. The growth rates of Chilean trout sampled from waters containing Aegla were rapid, suggesting that the abundant crab populations probably contribute significantly to the large size attained by Chilean trout. Laboratory observations confirmed that Aegla are detritivores and herbivores; in addition, they were found to be predators. Besides eating detritus and periphyton, they preyed on aquatic insects and fish. In an experiment, they crawled through 26 cm of rubble and gravel-sized rocks into two simulated trout redds and consumed 76% of the trout embryos and alevins. Because of the possible deleterious effects Aegla predation could have upon salmonid reproduction, the proposal to introduce them into California waters was rejected.--Copyright 1973, Biological Abstracts, Inc.
W73-13902

CHANGE OF CARP HELMINTH FAUNA DUE TO SUMMERING IN STREAMS,
Zooveterynarnyi Instytut, Lvov (USSR).
For primary bibliographic entry see Field 02I.
W73-13910

THE SETTING AND GROWTH OF THE MANILA CLAM, VENERUPIS JAPONICA (DESHAYES), IN HOOD CANAL, WASHINGTON,
Washington Univ., Seattle. Fisheries Research Inst.
T. T. Nosho, and K. K. Chew.
Available from the National Technical Information Service as COM-72-11429. In: 1971 Proceedings of the National Shellfisheries Association, Vol 62, p 50-58, 1972. 7 fig, 1 tab, 24 ref.
Descriptors: *Shellfish farming, *Clams, *Washington, Growth stages, Spawning, Productivity, Larvae, Aquatic environment, Life cycles.
Identifiers: *Venerupis japonica, *Hood Canal (Wash.), Spatfall, Artificial substrata, Japan

The Manila clam (Venerupis japonica) was accidentally introduced to the Pacific coast of North America with shipments of Pacific oyster seed from Japan. Some of the environmental conditions required for its successful setting and growth, specifically, the relationship between larvae and spat and the substrata were investigated. The influence of artificial substratum types on the setting of metamorphosing larvae, and subsequent growth of spats in these substrata were evaluated, the period of major spatfall in Hood Canal (Washington) determined, and the growth rate of spat to harvestable size estimated. Collectors containing seven artificial substratum types appeared to catch the spat of Venerupis japonica equally well at two study areas. Major period of spawning occurred from May through September. Spatfall was heaviest from June through October. Length frequency distributions of populations at three beaches were used to estimate growth and four age stages. Mean length at annual age increments was as follows: 24 mm after one year, 36 mm after two years, 40 mm after three years and 44 mm after four years. The growth rate suggests that conditions are favorable in Hood Canal Waters. (Jones-Wisconsin)
W73-13914

EFFECTS OF SALINE WATERS UPON SURVIVAL OF FISH EGGS AND LARVAE AND UPON THE ECOLOGY OF THE FATHEAD MINNOW IN NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-13981

EXPEDIENCY OF FALL CHINOOK SALMON ACCLIMATIZATION, (IN RUSSIAN),
Moscow State Univ. (USSR).
A. I. Smirnov.
Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 2, p 14-18. 1972 (English summary).
Identifiers: Acclimatization, *Chinook salmon, Fall, *Salmon, Fisheries management.

The catch of chinook salmon is less in Asian than in North American waters due to the morphological and ecological homogeneity of the populations. Chinook salmon in the USSR is present only in the summer spawning form. It does not enter many rivers and tributaries, and its range is discontinuous. There are races in North American waters with non-identical data of movement and spawning. It is suggested that the fall race breeds near outlets of the subsoil waters; it's fry lives in the rivers for a short period. It is possible to introduce chinook salmon in Kamchatka and Sakhalin Rivers, the Amur and the Caspian Sea, large lakes and artificial reservoirs of the European and Siberian areas of the USSR.--Copyright 1972, Biological Abstracts, Inc.
W73-14020

A CHECKLIST OF THE FISHES OF THE MONTEREY BAY AREA INCLUDING ELKHORN SLOUGH, THE SAN LORENZO, PAJARO AND SALINAS RIVERS,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 02L.
W73-14101

SOFT-SHELL CLAM POPULATION STUDY IN HAMPTON SEABROOK HARBOR, NEW HAMPSHIRE,
New Hampshire Fish and Game Dept. Concord.
For primary bibliographic entry see Field 02L.
W73-14151

BIOLOGICAL VALUE OF FISH AT DIFFERENT TROPHIC LEVELS IN RELATION TO THE CHOICE OF FISH FOR AQUACULTURE AND ACCLIMATIZATION, (IN RUSSIAN),
A. F. Karpevich.
Tr Vses Nauchno-Issled Inst Morsk Rybn Khoz Okeanogr 76 p 7-55 1970 English summary.
Identifiers: Acclimatization, *Aquaculture, Biological studies, Fish (Somatic productivity), Salmon, Sturgeon, Trophic levels.

The relative coefficient of somatic productivity of fish depends on the amount of and rate of mass accumulation during sexual maturation. Among fish with a single maturation period the lowest coefficient was observed in planktophages. Usually planktophages have the lowest rate of weight increase and the higest rate of maturity, which promotes quicker turnover of organic food substances in bodies of water. The same chain, made up of pelagic organisms, belongs to the 'cheapest' in food consumption. The food chain of ground fish, especially predaceous species, is biologically the most 'expensive.' However, due to the low somatic productivity the commercial production from short-cycle planktophages is not high. With large consumption rates in predaceous fish the rate of weight increase is high. The somatic productivity is also often high. In this case the commercial product acquires a high quality. The highest coefficient of productivity occurs in salmon and sturgeon.--Copyright 1972, Biological Abstracts, Inc.
W73-14152

CAGE CULTURE OF BLACK BULLHEADS, ICTALURUS MELAS (RAFINESQUE), IN NORTH DAKOTA,
North Dakota Univ., Grand Forks.
D. R. Hahn.
Available NTIS, Springfield, Va 22151 as COM-72-11169, Price $3.00 printed copy; $1.45 microfiche. M Sc Thesis, August 1972. 67 p, 4 fig, 15 tab, 81 ref.

Descriptors: *Catfishes, *Fish hatcheries, *Fish management, *North Dakota, Commercial fish, Fisheries, Economics, Growth stages, Fish diets, Fish diseases, Fish physiology, Mortality, Methodology, Evaluation.
Identifiers: *Black bullhead catfishes, Food conservation, Ictalurus melas.

The economic feasibility of rearing black bullhead catfish, Ictalurus melas (Rafinesque), in cages in North Dakota was investigated. The 2-year study consisted of rearing different population densities of fish with high coefficients of condition and stunted fish in cages. Bullheads did not have growth and feed conversion capacities of other Ictaluridae under similar culture; mortality was comparable. Water temperature was an important factor in regulating feeding activity and thus, growth. The flesh of cage reared bullheads had a higher lipid content than their wild counterparts. Because of low market value and poor feed conversion abilities, cage culture of bullheads in North Dakota is not profitable. (Woodard-USGS)
W73-14161

09. MANPOWER, GRANTS AND FACILITIES

9B. Education (In-House)

CAREER DEVELOPMENT GUIDE FOR WASTEWATER FACILITY PERSONNEL,
Black and Veatch, Kansas City, Mo. Facilities Operation Services Dept.
For primary bibliographic entry see Field 05G.
W73-14092

9D. Grants, Contracts, and Research Act Allotments

BIENNIAL REPORT, INSTITUTE OF WATER RESOURCES, UNIVERSITY OF ALASKA, 1972.
Alaska Univ., College. Inst. of Water Resources.

Available from the National Technical Information Serivce as PB-222 934, $2.75 in paper copy, $1.45 in microfiche. 1972. 17 p, 25 illus. OWRR-A-999-ALAS (1). 14-31-0001-3502.

Descriptors: Administration, Documentation, Grants, *Research and development, *Water Resources Institute, *Universities, *Education, Training.
Identifiers: Annual Report.

The purposes and objectives of the Alaska Institute of Water Resources, a bit of its history and numerous research projects of the Institute are described. Biographical information on several of the staff along with lists of publications and projects of the Institute since its inception are included. Included in the description of the projects are brief summaries on the water resources of Arctic Alaska, thermal pollution of the Chena River, a waste outfall study in Knik Arm near Anchorage, Alaska, a study of the occurrence of lead in small lakes in the Fairbanks area and a description of research work on an oxidation ditch waste treatment process near Fairbanks. (Carlson-Alaska)
W73-13652

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

RESEARCH IN SUPPORT OF PLANNING AND MANAGEMENT OF WATER AND RELATED LAND RESOURCES,
Federal Council for Science and Technology, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-13939

10C. Secondary Publication And Distribution

AERATION OF NATURAL WATERS, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-13651

INVENTORY AND EVALUATION OF INFORMATION ON DELAWARE BAY, VOLUME 3,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-13697

STRIP MINING, AN ANNOTATED BIBLIOGRAPHY,
For primary bibliographic entry see Field 05B.
W73-13709

10F. Preparation of Reviews

AERATION OF NATURAL WATERS, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-13651

INVENTORY AND EVALUATION OF INFORMATION ON DELAWARE BAY, VOLUME 3,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-13697

STRIP MINING, AN ANNOTATED BIBLIOGRAPHY,
For primary bibliographic entry see Field 05B.
W73-13709

THE HAEMATOLOGICAL ASSESSMENT OF THE HEALTH OF FRESHWATER FISH: A REVIEW OF SELECTED LITERATURE,
Trent Polytechnic, Nottingham (England).
For primary bibliographic entry see Field 05C.
W73-13813

LAGOON PERFORMANCE AND THE STATE OF LAGOON TECHNOLOGY.
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 05D.
W73-13985

NATURAL CHEMICAL QUALITY OF WATER RIVERS (MAJOR IONS)--A LITTERATURE REVIEW (QUALITE CHIMIQUE NATURELLE DE L'EAU DES RIVIERES (IONS MAJEURS)--REVUE DE LITTERATURE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 02K.
W73-13988

THE MODERN SCOPE OF HYDROGEOLOGY,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 02F.
W73-14123

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Alabama Univ., University.
For primary bibliographic entry see Field 05A.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 23
DECEMBER 1, 1973

W73-14201 -- W73-14750

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 6, NUMBER 23
DECEMBER 1, 1973

W73-14201 -- W73-14750

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

WATER IN BIOLOGICAL SYSTEMS, VOL 3.
For primary bibliographic entry see Field 02K.
W73-14650

02. WATER CYCLE

2A. General

PROBLEMS OF WATER RESOURCES USE AND CONSERVATION (PROBLEMY VODNYKH RESURSOV, IKH ISPOL'ZOVANIYA I OKHRANY),
Institute of Geography of Siberia and the Far East, Irkutsk. (USSR).
For primary bibliographic entry see Field 06B.
W73-14427

DECISIONS WITH INADEQUATE HYDROLOGIC DATA.

Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado, D. A. Woolhiser, editor: Water Resources Publications, Fort Collins, 1973. 290 p.

Descriptors: *Hydrologic data, *Data collections, *Decision making, Systems analysis, Cost-benefit analysis, Floods, Droughts, Reservoir design, Network design, Project planning, Water management.
Identifiers: *Inadequate hydrologic data.

There is a fundamental conflict of interest between the data gatherer and the water resource system designer and builder. The data expert wishes to improve the accuracy of his product which may require more years of observations with more accurate equipment. The designer and builder wish to get on with their work. In many circumstances the data are clearly inadequate. If there are no budget constraints one should gather data until the marginal cost of the data is equal to the marginal benefits attributable to the data. As a practical matter this point is very difficult to find because of uncertainties in the benefits. Papers of this Symposium are classified in three major groups: (1) network design and regional studies, (2) rainfall and runoff simulation, and (3) reservoir system analysis. (See also W73-14551 thru W73-14570) (Knapp-USGS)
W73-14550

AN ECONOMIC APPROACH FOR EVALUATING THE ADEQUACY OF HYDROLOGIC DATA,
Queen's Univ., Kingston (Ontario).
W. E. Watt, and K. C. Wilson.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 7-16, 1973. 1 fig, 5 ref.

Descriptors: *Data collections, *Network design, *Economics, *Cost-benefit analysis, Project planning, Decision making, Gages, Instrumentation, Hydrologic data, Water measurement, Stream gages, Rain gages, Precipitation gages.
Identifiers: *Inadequate hydrologic data.

Hydrologic data can be considered adequate when the marginal cost associated with improving the data is just equal to the marginal benefit resulting from such an improvement. This concept can be applied to decisionmaking in planning regional hydrometric networks. In this case, the cost of improving the data accuracy is equal to the cost of increasing and operating the network. A logical approach to the determination of marginal benefit-error of prediction is proposed. An expression is derived which relates the relative increase in cost of adopting a design different from the optimum to the error of prediction. This expression involves a capital cost exponent, a damage cost exponent, and a flood (or drought) frequency exponent; each exponent is defined by an average regional value. Application of this expression to the total future investment for a region yields the marginal benefit relation, which when combined with a marginal cost relation, can provide an objective basis for decisionmaking in the area of hydrometric network planning. (See also W73-14550) (Knapp-USGS)
W73-14551

DESIGN OF HYDROMETRICAL NETWORKS AND APPLICATION TO COLOMBIA,
World Meteorological Organization, Bogota (Colombia).
S. Stanescu, and W. Klohn.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 17-28. 1973. 2 fig, 17 ref.

Descriptors: *Data collections, *Network design, *Economics, *Cost-benefit analysis, Project planning, Decision making, Gages, Instrumentation, Hydrologic data, Water measurement, Stream gages, Rain gages, Precipitation gages.
Identifiers: *Inadequate hydrologic data, *Colombia.

In 1968, Colombia began to organize a national hydrological service. One of the main tasks of this new activity was the design of stream-gaging networks. In the siting of stations within its hydrological data system, the Colombian service faced three alternatives: (a) siting according to water use projects; (b) establishment of a minimal national network of basic stations; and (c) establishment of an optimal national network. Considering the existing facilities and the funds available, (b) was the alternative chosen. In the distribution of the stations, the predominant criterion was the establishment of a network that would yield indirect basic information for any point in the territory by regression of measured data with genetic factors of the hydrological regime. (See also W73-14550) (Knapp-USGS)
W73-14552

AN APPLICATION OF THE INADEQUATE HYDROLOGICAL DATA OF THE AFRICAN TROPICAL REGIONS IN ENGINEERING DESIGN,
National Council for Scientific Research, Lusaka (Zambia).
J. Balek.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 29-39, 1973. 4 fig, 1 tab, 7 ref.

Descriptors: *Data collections, *Network design, *Economics, *Cost-benefit analysis, Project planning, Decision making, Gages, Instrumentation, Hydrologic data, Water measurement, Stream gages, Rain gages, Precipitation gages.
Identifiers: *Inadequate hydrologic data, *Zambia.

Hydrological data available in African tropical regions usually consist of long precipitation records, rather short water level and discharge records and very short data for small, separated experimental catchments. No data from nearby, intensively observed basins are usually available. In most cases, where the extension of the existing network and improvement of the quality of the records is not technically possible, at least a system of representative/experimental catchments within a main basin should be established, supplying the data and information on those regionally specific phenomena which cannot be transferred from experiments in the catchments of developed countries. In most cases the influence of vegetation, morphology, and soil types on the hydrological cycle should be investigated. Intensive field surveys particularly during the occurrence of extremes, together with the tracing of historical records, can supply valuable additional information. (See also W73-14550) (Knapp-USGS)
W73-14553

SHORT DURATION RAINFALL DEPTH-DURATION-FREQUENCY MAP OF INDIA,
Assam State Electricity Board, Barapani (India).
A. C. Goswami.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 48-56, 1973. 6 fig, 11 ref.

Descriptors: *Depth-area-duration analysis, *Data collections, *Frequency analysis, Statistical methods, Duration curves, Hydrologic data.
Identifiers: *India, *Inadequate hydrologic data.

Short duration rainfall data are extremely scarce in developing countries like India. Thus short duration rainfall data for India are developed on the basis of rainfall relationships of other countries. The analysis is concerned only with durations of 2 hours or less, and all data are for point rainfall. U.S.A. rainfall ratios were used to develop the depth-duration-frequency maps of India from the 2 year, 24-hr rainfall isopleth map of India. (See also W73-14550) (Knapp-USGS)
W73-14555

COMPUTATIONS OF PEAK FLOODS WITH INADEQUATE HYDROLOGIC DATA,
Columbia Univ., New York.
G. J. Halasi-Kun.
In: Decisions with Inadequate Hydrologic Data; Poroceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 57-73, 1973. 6 fig, 12 ref.

Descriptors: *Peak discharge, *Rainfall-runoff relationships, *Hydrogeology, *New Jersey, Urbanization, Flood forecasting, Data collections, Surface-groundwater relationships, Lakes, Swamps, Forests, Floods, Hydrologic data.
Identifiers: *Inadequate hydrologic data.

A detailed investigation of the 100-year peak flood flow in New Jersey from areas less than 100 sq mi was based on the study of the hydroegology of the area. The results are compared with peak flood flow equations from Central Europe and the United States. From evaluation of point rainfall intensity and hydrogeologic qualities, diagrams and a basic runoff formula are developed for New Jersey. The entire State is divided into 10 hydrogeologic regions. Local corrections of the formula are established for the influence of lakes, swamps, wooded areas, shape of the watershed, and urbanization upon the 100-year peak runoff. (See also W73-14550) (Knapp-USGS)
W73-14556

DETERMINATION OF SOME HYDROLOGICAL FACTORS WITH A WELL RECORDER,
Ain Shams Univ., Cairo (Egypt).
M. M. Soliman.

In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 74-79, 1973. 2 fig, 1 tab, 3 ref.

Descriptors: *Storage coefficient, *Groundwater movement, *Aquifer testing, Drawdown, Data collestions, Water level fluctuations, Aquifer characteristics, Transmissivity, Hydrologic data.
Identifiers: *Inadequate hydrologic data.

A new equation is presented to obtain storativity of an aquifer with the help of recorder readings. A confined aquifer is replenished from a remote source such as a lake or a river. A well is located at some distance from the replenishing source and completely penetrates the aquifer. The water-level recorder in a single well is a substitute for observation wells. Piezometric groundwater contours are also essential for this method. Pumping tests from the single well should be carried out to get the aquifer transmissivity before establishing a water level recorder. (See also W73-14550) (Knapp-USGS)
W73-14557

THE USE OF TRACER DATA IN INCREASING THE INFORMATION ON HYDROLOGIC SYSTEMS,
Weizmann Inst. of Science, Rehovot (Israel). Isotope Dept.
A. Nir.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 80-87, 1973. 2 fig, 19 ref.

Descriptors: *Tracers, *Hydrologic cycle, Hydrogeology, Tritium, Carbon radioisotopes, Deuterium, Runoff, Stable isotopes, Oxygen isotopes, Streamflow, Hydrologic data, Groundwater movement, Data collections.
Identifiers: *Inadequate hydrologic data.

A review of tracer methods and new results in the field of stochastic treatment of tracer data is presented and evaluated in terms of additional information gained in hydrologic systems. Their contributions are in: (a) determination of specific hydrologic parameters; (b) confirmation or elimination of assumed models; (c) extension of hydrological data as used in system analysis; (d) formation of a connecting linkbetween system analysis and physical hydrology; and (e) supply of preliminary information on regional hydrological systems in the absence of hydrologic data. Examples of these uses are given. (See also W73-14550) (Knapp-USGS)
W73-14558

CONCEPT OF A TECHNIQUE FOR AN ANALYSIS OF WATERSHED RUNOFF EVENTS,
Agricultural Research Service, Riesel, Tex. Soil and Water Research Div.
J. R. Williams.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 111-120, 1973. 4 fig, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Hydrograph analysis, Unit hydrographs, Computers, Optimization, Data collections, Hydrologic data, Flood forecasting.
Identifiers: *Inadequate hydrologic data.

An optimization technique computes hydrologic variables that cannot be measured directly. Measured rainfall rates and storm hydrographs are used to compute unit hydrograph shapes and associated source runoff from complex storms. Optimized unit hydrographs vary considerably for different storms on the same watershed. These computed unit hydrographs can be used to develop relationships between unit hydrograph shape parameters and storm and watershed characteristics. The computed incremental source runoff can be used to develop and test infiltration equations for watersheds. Such equations should be more accurate in predicting source runoff from watersheds than equations developed with infiltrometer data. The optimization technique is efficient, as it will fit most storm hydrographs accurately with a moderate amount of computer time. (See also W73-14550) (Knapp-USGS)
W73-14559

EXPERIENCE WITH A MONTHLY RAINFALL--RUNOFF TRANSFER FUNCTION MODEL,
Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
F. Fahlbusch, and T. C. Muir
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 121-131, 1973. 4 fig, 2 tab, 11 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, Optimization, Computers, Parametric hydrology, Systems analysis, Water storage, Data collections, Hydrologic data.
Identifiers: *Inadequate hydrologic data

A monthly rainfall-runoff model can be used for the determination of synthetic long-term sequences from synthetic or observed rainfall sequences on catchments for which only limited runoff data are available. A transfer function of an exponential decay type is used in a linear model linking rainfall as imput and runoff as output. A modification of the model to include the effects of nonlinearity is proposed. Results of the application of both the linear and nonlinear models to five rivers are presented. (See also W73-14550) (Knapp-USGS)
W73-14560

THE USE OF EVOP AS A HYDROLOGIC TOOL,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
R. Y. McNeil, and S. O. Russell.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 132-142, 1973. 2 fig, 1 tab, 1 ref.

Descriptors: *Mathematical models, *Optimization, Computer programs, Systems analysis, Data collections, Hydrologic cycle, Hydrologic data, Water balance.
Identifiers: *Inadequate hydrologic data.

Practicing hydrologists are often faced with the problem of making decisions on the basis of inadequate data. Simple hydrologic models offer one way of making the most of the available data and at the same time lend themselves to sensitivity analysis. Evolutionary Operation (EVOP), developed as a practical method for improving the operation of chemical plants, can be adapted and used as a technique for optimization of hydrologic models. The basis of EVOP is that factorial experiments are run and results are displayed in a special format which is readily comprehensible to the operator, allowing him to improve his operation, while keeping in full control. When used with hydrologic models the same advantages apply, and the hydrologist can keep fully in control of his model at all times. EVOP allows several objectives to be considered simultaneously. Thus by carefully choosing the error indicators, it can be used as a diagnostic as well as an optimization tool. EVOP allows the parameters in any hydrologic model to be quickly optimized and the model thus pushed to its limit. (See also W73-14550) (Knapp-USGS)
W73-14561

A SIMULATION TECHNIQUE OF MONTHLY RUNOFF BY USE OF PRECIPITATION TIME SERIES AT MULTISTATIONS,
Hokkaido Univ., Sapporo (Japan). Dept of Civil Engineering.
K. Hoshi, and I. Yamaoka
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 143-153, 1973. 1 fig, 4 tab, 3 ref.

Descriptors: *Simulation analysis, *Time series analysis, *Stochastic processes, Data collections, Mathematical models, Hydrologic data, Rainfall-runoff relationships, Statistics, Variability, Statistical models
Identifiers: *Inadequate hydrologic data

The application of simulation techniques is particularly valuable as water resources planning problems become more complex. However, one of the difficulties encountered in practice is that in many cases decisions regarding water resources developments must be based on inadequate data both in time and in space. To overcome this situation, multivariate statistical procedures are based on stochastic processes consisting of both deterministic components and random components. Some procedures discussed are simultaneous generation of monthly precipitation at several satellite stations from a key station; determination of areal precipitation for a specified month as the actual inputs to the runoff system; simultaneous generation of monthly runoff at given stations with incorporation of areal precipitation to improve the simulation models; and adoption of matrix representation, which is a very useful strategy for evaluating the complex interrelationships of spatial and temporal variations of hydrologic events in watershed models and for minimizing stochastic random components. (See also W73-14550) (Knapp-USGS)
W73-14562

ON THE USE OF SHORT-TERM DATA FOR STREAMFLOW SYNTHESIS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
R. G. Quimpo.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 154-160, 1973. 2 fig, 15 ref.

Descriptors: *Mathematical models, *Statistical models, *Rainfall-runoff relationships, Parametric hydrology, Synthetic hydrology, Stochastic processes, Data collections, Hydrologic data, Markov processes.
Identifiers: *Inadequate hydrologic data.

The generation of streamflow sequences from which the distribution of design variables in water resources planning are determined requires the estimation of stochastic parameters from relatively long hydrologic records. When hydrologic data are inadequate, a possible alternative is to make use of the relation between parametric and stochastic models to deduce parameters from short-term rainfall-runoff events. Using basin storage properties as common determinants characterizing both models, a scheme is outlined whereby information from short duration hydrographs may be employed to obtain a model for generating streamflows. The concepts may be applied to both Markov and non-Markov models. (See also W73-14550) (Knapp-USGS)
W73-14563

A SIMILAR STORM METHOD ON FILLING DATA VOIDS,
Tokushima Univ., (Japan). Dept. of Engineering.
M. Hashino.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 161-173, 1973. 6 fig, 2 tab, 1 ref.

Descriptors: *Hydrologic data, *Rainfall, *Storms, Regression analysis, Statistical methods, Rain gages, Data collections.
Identifiers: *Inadequate hydrologic data, Similar storm.

The concept of 'similar storm' is introduced for estimation of missing rainfall sequences on the assumption that storms missing in the record exist as 'historic storms'. A group of gaging sites, which have similar rainfall characteristics, is selected to include a given site with storm data voids. The most similar storm to a given void storm at the site is selected on the basis of coefficient matrices of areal cross-correlation obtained from historic rainfall data of many storms. It is necessary that the rainfall sequences of the storm considered be perfectly observed at several sites of the selected gaging group except the site concerned. The rainfall sequence of the void storm at the given site is obtained from linear regression analysis using the similar storm and the partial void storm. (See also W73-14550) (Knapp-USGS)
W73-14564

ANALYSIS OF MONTHLY RAINFALL PROBABILITIES BY WEIGHTED TRANSFORMATION,
Engineering Consultants, Inc., Denver, Colo.
Y. Au-Yeung.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 174-181, 1973. 4 fig, 4 tab, 2 ref.

Descriptors: *Rainfall, *Probability, Statistical methods, Data collections, Hydrologic data, Distribution patterns.
Identifiers: *Inadequate hydrologic data.

Reliable rainfall probability estimates are essential for irrigation project planning and decisionmaking, especially where data are inadequate or limited. A simple and versatile method for analyzing monthly rainfall probability uses a combination of three types of data transformation and the mixed distribution method to transform monthly rainfall data. The three types of data transformation are normal, log-normal, and square-root. Application of the method is shown in an example using the monthly rainfall data of Kabinburi Weather Station in Thailand. Results indicate that a best fit distribution for the observed monthly rainfall data can easily be obtained. (See also W73-14550) (Knapp-USGS)
W73-14565

EVALUATION OF MULTIANNUAL FIRM HYDROELECTRIC POWER--A NEW METHOD,
Hidrotecnica Portuguesa, Lisbon. Dept. of Civil Engineering.
A. A. Manzanares, J. Santos, and L. V. Tavares.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 205-209, 1973. 2 ref.

Descriptors: *Water yield, *Reservoir yield, *Safe yield, *Time series analysis, System analysis, Regulation, Water storage, Hydroelectric power, Data collections, Hydrologic data.
Identifiers: *Inadequate hydrologic data.

A method is presented to evaluate the firm power produced by complex hydroelectric systems with large multiannual reservoirs. If the known sample of annual energetic inflows is scarce and the guarantee is defined over a long period, this method is preferable to those currently used. Instead of studying the accumulated annual inflows, the series of multiannual inflows is analyzed. Monte Carlo techniques are used to estimate variables with small variances. (See also W73-14550) (Knapp-USGS)
W73-14566

INADEQUATE HYDROLOGIC DATA AND RESERVOIR CAPACITY,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
T. A. McMahon, and G. P. Codner.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 210-219, 1973. 5 tab, 11 ref.

Descriptors: *Reservoir storage, *Streamflow forecasting, *Data collections, Statistical methods, Probability, Hydrologic data, Time series analysis, Distribution patterns, Statistical models.
Identifiers: *Inadequate hydrologic data.

Inadequate streamflow data result from measurement errors and shortness of record. Sampling errors which follow from inadequate data are examined for their effect on streamflow generation models and storage analysis. The effect on storage estimates of assuming different inflow idstributions is also considered. The comparative significance of absolute errors resulting from inadequate specification of means, skews, and serial correlations is also discussed. In general, 36 years of record is adequate. For the distribution study, two- and three-parameter log-normal models, a log transformed data model, and one based on the historical distribution of the random component were compared on the basis of replicated flow parameters and storage estimates. No distribution produced satisfactory results for all rivers. Preservation of the mean flow is more important that the serial correlation. Because of the effect of implied skew, care should be taken in using the two-parameter log-normal distribution in data generation models. (See also W73-14550) (Knapp-USGS)
W73-14567

EFFECTS OF INADEQUACE OF HYDROLOGIC DATA ON RELIABILITY OF WATER RESOURCES DESIGN,
Osaka Univ. (Japan). Dept. of Civil Engineering.
A. Murota, and T. Eto.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 220-237, 1973. 9 fig, 1 tab, 1 ref.

Descriptors: *Data collections, *Hydrologic data, *Reservoir design, Systems analysis, Safe yield, Streamflow forecasting, Hydrograph analysis, Simulation analysis.
Identifiers: *Inadequate hydrologic data.

Inadequacy of hydrologic data severely effects the reliability of design. An approximate method for calculating a linear reservoir system equivalent to a general reservoir system is given. The proposed method of linearization may simplify the analytical treatment of the reservoir system and make analytical studies of the total system possible, while maintaining qualitative behavior of the actual reservoir system. Gross shortage of water through the observation period was evaluated. An equation was deduced to represent the relation between the shortage and sample size, mean, standard deviation and autocorrelation coefficient of natural discharge sequences, the capacity of the reservoir, and the target draft. By using the equation and simulation, effects of error in observation and sample size of discharge data on reliability of a water resources design were investigated. (See also W73-14550) (Knapp-USGS)
W73-14568

EVALUATION OF DROUGHT EFFECTS AT LAKE ATITLAN,
Hydrologic Engineering Center, Davis, Calif.
A. D. Feldman.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 238-251, 1973. 1 fig, 3 tab, 6 ref.

Descriptors: *Water balance, *Reservoir evaporation, *Reservoir yield, *Hydrologic data, Data collections, Mathematical models, Simulation analysis, Synthetic hydrology, Water level fluctuations.
Identifiers: *Inadequate hydrologic data, *Lake Atitlan (Guatemala).

Guatemala's Lake Atitlan is a natural sink for a small watershed which lies in the central highlands adjacent to the Pacific coastal plain. Guatemala plans to develop hydropower from this lake by tunneling through the southern boundary of the lake to develop head down the coastal slope. Streamflows from nearby basins will be diverted into the lake to replace lake water used for hydropower. Limited data are available for streamflow, precipitation, and lake surface elevations, but there is no lake evaporation or seepage. The lake elevation record is 25 years long, while precipitation and streamflow data in the study area range from 1 to 9 years. In order to simulate the operation of the lake during the historical period, it was necessary to estimate the natural water balance of the lake as well as the missing records of the streamflows at the diversion sites. Because of the lack of evaporation and seepage data, changes in lake storage as reflected by changes in lake elevation were used to represent the natural water balance of the lake. The missing streamflow records could be reconstructed using the change in the lake elevation. (See also W73-14550) (Knapp-USGS)
W73-14569

THE HYDROLOGICAL FEASIBILITY OF VARIABLE WATER SUPPLY POLICIES,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
J. Bargur, and M. Gablinger.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 252-265, 1973. 3 fig, 10 ref.

Descriptors: *Water supply, *Variability, *Water resources development, Linear programming, Mathematical models, Simulation analysis, Water policy, Data collections, Water management (Applied), Water yield, Hydrologic data.
Identifiers: *Inadequate hydrologic data, *Israel.

In regions where scarcity of water resources is increasing and thus marginal quantities of water are becoming more important, it seems possible to increase the long-run regional water potential by establishing a variable water supply policy. To study this policy, a combination of linear programming and siumlation models was applied in a two-stage program. The hydrological feasibility of variable water supply policies was tested using the Israel water supply system as a case study. Under a variable supply policy the average annual allocation can be increased by more than 10% and the stipulated allocation can be met 98% of the time. (See also W73-14550) (Knapp-USGS)
W73-14570

WATER BALANCE IN EUROPE (VODNYY BALANS YEVROPY),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
G. M. Chernogayeva.
Izdatel'stvo Vsesoyuznyy Institut Nauchnoy i Technicheskoy Informatsii, Moscow, 1971. 140 p.

Descriptors: *Europe, *Water balance, *Water resources, Hydrologic cycle, Precipitation (Atmospheric), Evaporation, Runoff, Surface runoff, Subsurface runoff, Groundwater, Soil water, Glaciers, Mountains, Hydrographs, Sea level, Elevation, Maps, Equations, Estimating, Investigations.
Identifiers: USSR, Alps.

This monograph is the second in a series of publications on continental water balances and was prepared by the Department of Hydrology of the USSR Academy of Science's Institute of Geography. A method developed at the Institute for water-balance studies is based on solution of a system of differentiated equations characterizing the lithogenic component of the hydrologic cycle, including groundwater and soil water. Maps are compiled for total river runoff, subsurface and surface runoff, evaporation, and total moisture, and relations are established between water-balance items and sea-level elevation for different regions in the Alps. Balance estimates are given of water resources for each European country and for economic regions in the European part of the USSR. (Josefson-USGS)
W73-14598

IS THERE AMPLE FRESHWATER ON EARTH, (MNOGO LI PRESNOY VODY NA ZEMLE),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
M. I. Lvovich.
Priroda, No 5, p 7-17, 1973. 8 fig, 1 tab.

Descriptors: *Freshwater, *Water resources, *Water balance, *Hydrologic cycle, Precipitation (Atmospheric), Runoff, Subsurface runoff, Surface runoff, Soil water, Evaporation, Water sources, Geographical regions, Africa, Maps, Equations.
Identifiers: *USSR, Hydrosphere, Water exchange.

The hydrologic cycle has provided man with abundant freshwater resources, although natural conditions in certain regions have produced acute water shortages. Moreover, improper use of water has led to pollution of streams and other water bodies. Revamping of principles and approaches toward use and conservation of water will solve the problem of the world's water supply. Relations of evaporation and subsurface runoff to total soil moisture for the USSR and of total runoff to precipitation for Africa and graphed; water balance and freshwater resources of continents are tabulated; and total runoff, subsurface runoff, surface runoff, total soil moisture, and evaporation of world land areas are mapped. (Josefson-USGS)
W73-14602

THEORETICAL ANALYSIS OF THE ROLE OF SUBSURFACE FLOW IN THE GENERATION OF SURFACE RUNOFF: 2. UPSTREAM SOURCE AREAS,
IBM Watson Research Center, Yorktown Heights, N.Y.
R. A. Freeze.
IBM Research Report RC 3795, March 22, 1972. 32 p, 11 fig, 25 ref. OWRR C-3144 (No 3694) (4).

Descriptors: *Subsurface runoff, *Streamflow, *Groundwater movement, *Rainfall-runoff relationships, *Hydraulic models, Hydrologic data, Correlation analysis, Theoretical analysis, Mathematical studies, Environmental effects, Topography, Geomorphology, Soil types, Overland flow, Infiltration, Inflow, Hydrogeology, Base flow, Unsaturated flow, Saturated flow

Runoff simulations for hypothetical upstream source areas, carried out with a deterministic mathematical model that couples channel flow and saturated-unsaturated subsurface flow, provide theoretical support for the runoff-generating mechanisms observed in the field by Ragan (1968) and Dunne (1970). The simulations show that there are stringent limitations on the occurrence of subsurface stormflow as a quantitatively-significant runoff component. It is a feasible mechanism only on convex hillslopes that feed deeply-incised channels, and then only when saturated soil conductivities are very large. On concave slopes with lower permeabilities, and on all convex slopes, hydrographs are dominated by direct runoff via very short overland flow paths from precipitation on transient, near-channel wetlands. On these wetlands, surface saturation occurs from below due to rising water tables that are fed by vertical infiltration rather than by lateral subsurface flow. Classic Hortonian overland flow is a rare occurrence in time and space. These conclusions have implications in the planning of field instrumentation networks, and in the design of hydrologic response models. (See also W72-10905 and W73-00668) (Woodard-USGS)
W73-14608

A NUMERICAL MODEL OF A FJORD ESTUARY. I. BASIC CONSIDERATIONS AND PROPOSED FINITE DIFFERENCE SCHEMES,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02L.
W73-14619

HIGH YIELD FROM THE BULL RUN WATERSHED,
British Columbia Dept. of Municipal Affairs, Victoria. Environmental Planning and Management Div.
L. V. Luchin.
Journal of the American Water Works Association, Vol 65, No 7, p 183-186, March 1973. 2 tab.

Descriptors: Water balance, *Runoff, *Watersheds (Divides), *Watershed management, *Evapotranspiration control, Precipitation (Atmospheric), Evapotranspiration, Soil moisture, Evaporation, Water yield, *Oregon.
Identifiers: *Bull Run Watershed (Ore), Interception Loss, Mount Hood National Forest.

A water balance equation was used for calculating the amount of runoff in the Bull Run watershed in Mt. Hood National Forest, about 25 miles east of Portland, Oregon. Calculated runoff was then compared with measured runoff. Calculated runoff was 84.22 inches annually, while measured runoff was 102.56 inches - 20% higher than expected. The difference of about 18 inches is explained partly as up to 9 inches of calculation error, and partly as water seepage into the Bull Run watershed from adjoining basins. Porous bedrock underlying the area and measurements on three small tributaries support the latter conclusion. The excess of measured runoff over calculated runoff led to the conclusion that Bull Run was a 'high-yield' watershed. The equation for computing runoff is X±a-b-c-d-e, where X± calculated generated water, a ± gross or measured precipitation, b ± interception loss, c ± evapotranspiration loss, d ± soil moisture storage change, and e ± evaporation from free water surfaces. Limited deforestation is suggested as a means of increasing water yield, but reservations are expressed about impact of deforestation on other watershed resources. (Stein-North Carolina)
W73-14687

NEW APPROACHES TO WATER-RESOURCES INVESTIGATIONS IN UPSTATE NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02F
W73-14709

2B. Precipitation

MULTISPECTRAL REMOTE SENSED IMAGE ANALYSIS BY A SPECIAL ELECTRONIC SYSTEM,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 07B
W73-14338

RELATIVE DETACHABILITY OF SOIL PARTICLES BY SIMULATED RAINFALL,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station
For primary bibliographic entry see Field 02J.
W73-14414

THE PROBLEM OF ASSESSING THE EROSIVE POWER OF RAINFALL FROM METEOROLOGICAL OBSERVATIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 02J.
W73-14415

HYDROMETEOROLOGICAL INVESTIGATIONS IN KAZAKHSTAN (GIDROMETEOROLOGICHESKIYE ISSLEDOVANIYA V KAZAKHSTANE).
Kazakhskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Alma-Ata (USSR).

Kazakhskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 36, Leningrad, N. F. Gel'mgol'ts, editor, 1970. 196 p.

Descriptors: *Investigations, *Meteorology, *Climatology, *Precipitation (Atmospheric), *Runoff, Flood discharge, Time of concentration, Permafrost, Glaciers, Mountains, Mudflows, Sands, Vegetation, Water resources, Air pollution, Synoptic analysis, Weather forecasting, Weather modification, Correlation analysis, Bibliographies.
Identifiers: USSR, *Kazakhstan, Aerology.

Development of hydrometeorological studies in Kazakhstan from early post-revolutionary years to the present is reviewed in this commemorative issue published by the Kazaky Hydrometeorological Scientific Research Institute (KazNIGMI) on the occasion of the 50th anniversary of the founding of the Kazakh Soviet Socialist Republic. Individual papers deal with structural analysis and forecasting of climatic fluctuations; structure of long-term annual precipitation frequence; spatial distribution of precipitation and its consideration in storm runoff computations; calculation of maximum storm-flood discharges; calculation of concentration time in a mountain basin; climatic characteristics of Alma-Ata and their role in polluting the atmosphere of the city; agrometeorological studies of pasture vegetation in Kazakhstan; size distribution of soil particles in southern Kazakhstan as a result of aeolian processes; medical and climatic conditions in lowland and mountain regions of southern Kazakhstan, etc. A bibliography of monographs, transactions, observation data, manuals, and other literature published by KazNIGMI is appended. (Josefson-USGS)
W73-14433

CONCENTRATION RATIOS OF SALTS AT THE SEA SURFACE AND IN RAINWATER COLLECTED OVER THE SEA (SOOTNOSHENIYE KONTSENTRATSIY SOLEY NA POVERKHNOSTI OKEANA I V MORSKOY ATMOSFERNOY VLAGE),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.

For primary bibliographic entry see Field 02K.
W73-14435

STUDY OF URBAN EFFECTS ON PRECIPITATION AT ST. LOUIS,
Illinois State Water Survey, Urbana.
S. A. Changnon Jr.
April 1973. 34 p, 17 fig, 10 tab, 11 ref. NSF GI-33371.

Descriptors: *Weather, *Urbanization, *Environmental effects, Weather modification, Weather patterns, Missouri, Data collection, Weather forecasting.
Identifiers: *St. Louis (Missouri).

The effects of an urban environment on climate were studied at St. Louis, Missouri. The study centered on 14 goals, including: (1) a study of surface rainfall and severe weather to define their time and space distribution and delineate any anomalies, (2) the investigation of low level airflow and circulation patterns, (3) urban water quality, (4) synoptic weather analyses, (5) definition of the causes of anomalies, (6) local and regional planning incorporating man-made weather changes, (7) improvements in local weather forecasting, (8) air pollution studies, (9) planning for weather modification, (10) relevance of weather anomalies to water resources, hydrologic designs, agriculture, ecology and business, and (11) transfer of knowledge and technology to other disciplines. The results are presented of the previous year's activities for each of the goals supported by the National Science Foundation. Significant influences of the urban environment on weather patterns were discovered. (Poertner)
W73-14539

NEW METHOD OF FORECASTING MUDFLOWS FROM THUNDERSTORMS (NOVYY METOD PROGNOZIROVANIYA SELEVYKH POTOKOV PO GROZAM),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02J.
W73-14599

NOTE ON THE KINETIC ENERGY SPECTRUM OF COASTAL WINDS,
Oregon State Univ., Corvallis. Dept of Oceanography.
D. E. Frye, S. Pond, and W. P. Elliott.
Monthly Weather Review, Vol 100, No 9, p 671-673, September 1972. 2 fig, 7 ref. ONR N00014-67-A-0369-0007.

Descriptors: *Coasts, *Winds, *Sea breezes, *Land breezes, Climates, Kinetics, *Oregon.
Identifiers: Power density spectrum, Land-sea temperature differences, *Kinetic energy (Winds).

This study was conducted to determine if the power density spectrum of coastal winds contained the same spectral gap, where there is very little eddy kinetic energy, as has been found in some localities. An examination of the spectrum of winds along the Oregon coast shows a major diurnal peak at a period of 24 hr and a small microscale peak at about 50 hrs. The 24-hr peak is thought to be associated with the diurnal variation of land-sea temperature difference. (Sinha - OEIS)
W73-14642

PERIODIC MOTIONS OF THE SEASONAL THERMOCLINE ALONG THE SOUTHERN CALIFORNIA COAST,
Naval Electronics Lab. Center, San Diego, Calif.
For primary bibliographic entry see Field 02E.
W73-14646

2C. Snow, Ice, and Frost

FINAL REPORT ON DRIFT STATION BIOLOGY: ZOOPLANKTON TAXONOMY AND SORTING PROGRAMS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W73-14312

METALLOGENIC SIGNIFICANCE OF ALASKAN GEOSTRUCTURES SEEN ON NIMBUS AND ERTS IMAGES,
For primary bibliographic entry see Field 07C.
W73-14331

THE PHYSICAL MEANING OF TWO-DIMENSIONAL STRESSES IN A FLOATING ICE COVER,
Washington Univ., Seattle. Div. of Marine Resources.
J. F. Nye.
AIDJEX Bulletin No 21, University of Washington, Division of Marine Resources, p 1-8, July 1973. 4 ref.

Descriptors: *Sea ice, *Deformation, *Rheology, Stress, Strain, Stress analysis.

A conceptual difficulty is presented by two-dimensional models of sea-ice cover. The real ice cover is three-dimensional. How to relate the two-dimensional stresses in the models to the real three-dimensional stresses needs to be resolved before the physical plausibility of any proposed two-dimensional rheology can be determined. If a three-dimensional incompressible viscous continuum floating on water were looked at as a two-dimensional continuum, the two-dimensional medium would appear to have a bulk viscosity equal to three times its shear viscosity; the two-dimensional stresses would have to be related to the three-dimensional stresses by a function of thicknesses; and the momentum equations would not be valid since they omit the derivatives of potential energy. (Knapp-USGS)
W73-14399

THE MEANING OF TWO-DIMENSIONAL STRAIN-RATE IN A FLOATING ICE COVER,
Washington Univ., Seattle. Div. of Marine Resources.
J. F. Nye.
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 9-17, July 1973. 3 fig, 2 ref.

Descriptors: *Sea ice, *Rheology, *Strain measurement, *Deformation, *Instrumentation, Variability, Strain gages, Measurement, Strain.

The AIDJEX main experiment includes the measurement of strain in the icepack on certain scales, and it is proposed to model the ice as a two-dimensional continuum. The strains are to be measured by observing the change in position of points fixed in the ice, or by measuring the change in separation of such points. The existence of leads, pressure ridges, and other features shows that the deformation of the icepack is inhomogeneous or discontinuous on the scale of these features; so the result of a measurement may depend somewhat on the precise relation between a measurement point and some local feature. Velocity variations exist on virtually all scales; it is necessary to instrument on a scale appropriate to the scale of the deformation to be measured. (Knapp-USGS)
W73-14400

IS THERE ANY PHYSICAL BASIS FOR ASSUMING LINEAR VISCOUS BEHAVIOR FOR SEA ICE,
Washington Univ., Seattle. Div. of Marine Resources.
J. F. Nye.
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 18-19, July 1973.

Descriptors: *Sea ice, *Rheology, *Strain measurement, *Deformation, *Instrumentation, Variability, Strain gages, Measurement, Strain.

A number of models for the large-scale behavior of the arctic sea ice use a linear viscous law for the interaction of the ice with itself. There is no sound evidence, either from the degree of success of these models or from independent sources, that the ice behaves in a viscous manner. Ice probably exhibits brittle behavior under tension, combined with strain-hardening behavior under compression. Strain-hardening under compression, by the successive crunching of thicker ice, would be consistent with the Parmerter-Coon ridging model. Although the ice, modeled as a continuum, is brittle or plastic on time scales of days or weeks, it may nevertheless appear to be viscous on longer time scales. Large random stresses from storms fracture the ice, and the small, long-term steady stress can take advantage of the favorable opportunities so presented. Nothing more happens until the next storm, when the process is repeated. The 'viscosity' would be inversely related to the frequency and intensity of the storms, rather than being any intrinsic property of the ice. (Knapp-USGS)
W73-14401

AN APPROACH TO COUPLING THE DYNAMICS AND THERMODYNAMICS OF ARCTIC SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
G. A. Maykut.
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 23-29, July 1973. 3 fig. ONR Contract N00014-67-A-0103-0007 NSF Grant GV-28807.

Descriptors: *Sea ice, *Thermodynamics, *Rheology, *Water balance, Deformation, Melting, Freezing, Ablation.
Identifiers: *Sea ice dynamics.

Thermodynamics influences the dynamic behavior of sea ice primarily through the formation of new ice on areas of open water, and through ablation and accretion on the horizontal boundaries of existing ice. These mass changes are used in the momentum balance equations and affect the material properties of the icepack. To satisfy the needs of proposed dynamic models, it is necessary to describe changes in the total mass, the area of open water, and the area of thin ice within specified regions. Thermodynamic models can predict growth rates as a function of ice thickness and season; however, the needs of advanced dynamic models cannot be met without some knowledge of the distribution of ice thickness. The continuous range of ice thicknesses is calculated as a number of discrete categories. Equations are then developed to describe how the area covered by each category changes as a result of ice growth, advection, and divergence. The method is independent of any particular dynamic model since the only dynamic input required is the velocity field of the ice. (Knapp-USGS)
W73-14402

ON THE THICKNESS DISTRIBUTION OF SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
A. S. Thorndike, and G. A. Maykut.

AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 31-47, July 1973. 11 fig, 3 ref. ONR Contract N00014-67-A-0103-0007 NSF Grant GV-28807.

Descriptors: *Sea ice, *Thermodynamics, *Rheology, *Water balance, Deformation, Melting, Freezing, Ablation.
Identifiers: *Sea ice dynamics.

A region on the surface of the Arctic Ocean may contain ice of many different thicknesses, the relative proportions of which are described by an ice thickness distribution function. The ice thickness distribution regulates the heat exchange between the atmosphere and the ocean, it determines the navigability of ice-covered waters, and it determines the rheological properties of the icepack. The change in area of a region of sea ice results in a redistribution of ice within the region. In divergence, the ice breaks apart; rather than stretching and becoming thinner, it fails, creating open water. In convergence, the thinnest ice is crushed first and piled in some arbitrary way to create thicker, ridged ice. (Knapp-USGS)
W73-14403

THE STEADY DRIFT OF A INCOMPRESSIBLE ARCTIC ICE COVER,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
D. A. Rothrock.
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 49-77, July 1973. 11 fig, 1 tab, 29 ref. ONR N00014-67-A-0103-0007 NSF Grant GV-28807.

Descriptors: *Sea ice, *Stress, *Strain, *Ocean currents, *Ocean circulation, Rheology, Deformation, Arctic Ocean.
Identifiers: *Sea ice drift.

The steady drift of sea ice in an idealized Arctic Basin was calculated assuming that the ice is incompressible and inviscid. The momentum and continuity equations for the ice were solved for the velocity and the ice pressure. The boundary conditions require that no ice flow across coastal boundaries, but that ice flow out of the basin into the Greenland Sea and into the basin from the Kara Sea. The patterns of calculated velocities and vorticities are realistic, but their magnitudes are too high. When the wind stress is reduced to one-third the strength first assumed, realistic speeds and vorticities are obtained. The maximum calculated ice pressure is marginally able to ridge thick ice, according to the ridging model of Parmerter and Coon. These maximum values occur near Greenland where intense ridging is reported. (Knapp-USGS)
W73-14404

DIFFERENTIAL SEA ICE DRIFT I: SPATIAL AND TEMPORAL VARIATIONS IN MESOSCALE STRAIN IN SEA ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, W. F. Weeks, A. Kovacs, and S. F. Ackley.
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 79-113, July 1973. 15 fig, 4 tab, 14 ref. NSF Grant AG-344.

Descriptors: *Sea ice, *Stress, *Strain, *Ocean currents, *Ocean circulation, Rheology, Deformation, Arctic Ocean.
Identifiers: *Sea ice drift.

Measurements of mesoscale strain in sea ice were carried out over a 5-week period in spring 1972 at the main AIDJEX camp in the Beaufort Sea. They were analyzed to determine inhomogeneities in the strain. A least squares strain tensor time series was also calculated. The least squares divergence between day 83 and 112 exhibited five significant strain events consisting of dilatation followed by convergence. Net areal changes were as large as 3%. Divergence rates were up to 0.12% per hour and shear rates were as large as 0.10% per hour. In the principal axis coordinate system, the events typically exhibited a much larger compression (or extension) along one axis than along the other. The average strain rate tensor could be calculated with rate magnitudes larger than the inhomogeneity variation. The inhomogeneity variation had a scale inversely with the square root of the average length of the strain lines and was only slightly dependent on frequency for frequencies above one cycle per day. Sampling intervals of up to 10 hours are generally adequate for resolving low-frequency strain rates. Low-frequency events show significantly greater spatial correlation than do higher-frequency events. (See also W73-14406) (Knapp-USGS)
W73-14405

DIFFERENTIAL SEA ICE DRIFT II: COMPARISON OF MESOSCALE STRAIN MEASUREMENTS WITH LINEAR DRIFT THEORY PREDICTIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III.
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 115-137, July 1973. 5 fig, 2 tab, 18 ref. NSF Grant AG-344.

Descriptors: *Sea ice, *Stress, *Strain, *Ocean currents, *Ocean circulation, Rheology, Deformation, Arctic Ocean.
Identifiers: *Sea ice drift.

The divergence rate and vorticity of sea ice drift follow the local pressure and wind divergence: for low atmospheric pressures and converging winds, the divergence rate is negative and the vorticity counterclockwise; for high pressures and diverging winds, the divergence rate is positive and the vorticity clockwise. This behavior agrees with predictions based upon the infinite boundary solution of linearized drift theory in the absence of gradient current effects and using the constitutive law proposed by Glen for pack ice. The infinite boundary solution of the linear drift equation indicates that in a low-pressure region the ice converges for high compactness (winter) and diverges for low compactness (summer). Calculations were also carried out using a more general linear constitutive law which allows the viscosities to vary with temporal frequency and which includes as special cases a generalized Hookes law as well as the Glen law. A best fit of this more general calculation with strain measurements agrees better with viscous behavior than with elastic behavior, with the frequency dependence of the estimated viscosities approximating closely the Glen law behavior. (See also W73-14405) (Knapp-USGS)
W73-14406

SONAR MAPPING OF THE UNDERSIDE OF PACK ICE,
Wisconsin Univ., Middleton. Geophysical and Polar Research Center.
T. K. Kan, C. S. Clay, and J. M. Berkson.
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 155-169, July 1973. 9 fig, 10 ref. ONR Contract N00014-67-A-0128-0019.

Descriptors: *Sea ice, *Surveys, *Sonar, Topography, Deformation, Instrumentation.
Identifiers: *Sea ice ridges.

An under-ice survey was carried out in a pack icefield near Fletchers Ice Island (T-3) by means of a 48 kHz Kelvin Hughes transit sonar lowered through a hole. Five sets of data were collected and transformed into polar coordinate mosaics. The echo length, the shadow zone, the arrival time of echoes, and the sounding depth provide the basic information for interpretation. A complete under-ice map was constructed to show the distribution of the under-ice features. The keel depths of the ridges have been estimated; the average ratio of the peak top elevation to the keel depths is 1.76 (Knapp-USGS)
W73-14407

ARCTIC SEA ICE RIDGE FREQUENCY DISTRIBUTIONS DERIVED FROM LASER PROFILES,
Naval Oceanographic Office, Washington, D.C. Polar Oceanography Div.
W. B. Tucker, III, and V. H. Westhall
AIDJEX Bulletin No 21, Washington University Division of Marine Resources, p 171-180, July 1973. 5 fig, 2 tab, 5 ref

Descriptors: *Sea ice, *Surveys, *Topography, Deformation, Instrumentation, Profiles.
Identifiers: Lasers.

Roughness characteristics of the sea-ice surface were obtained by using basic statistical techniques applied to laser profile data. Ice ridge frequency distributions were calculated for 3600 km of polar ice. Of the sections containing fewer than 0.5 ridges per kilometer, 90% were located off the Alaskan coast below 77 deg north latitude. Of the sections with more than 5.0 ridges per km, 82% were in the nearshore areas extending from northeastern Greenland through the Lincoln Sea and along the Canadian Archipelago to Banks Island. (Knapp-USGS)
W73-14408

STUDY OF GLACIERS IN SIBERIA AND SOVIET FAR EAST DURING YEARS OF SOVIET RULE (IZUCHENIVE LEDNIKOV V SIBIRI I NA DAL'NEM VOSTOKE ZA GODY SOVETSKOY VLASTI),
Institute of Geography of Siberia and the Far East, Irkutsk. (USSR).
L. N. Ivanovskiy.
Institut Geografii Sibiri i Dal'nego Vostoka Doklady, No 26, p 54-60, Irkutsk, 1970. 32 ref.

Descriptors: *Glaciology, *Glaciers, Mountains, Ice, Snowpacks, International Geophysical Year, Investigations.
Identifiers: USSR, *Siberia, *Soviet Far East.

Mountain-glacier investigations in Siberia and Soviet Far East are divided into 5 periods of glacier study: (1) the prerevolutionary period; (2) the period from the revolution to the International Polar Year (1932-33); (3) the period from the International Polar Year to the start of the International Geophysical Year; (4) the period of the International Geophysical Year (1957-59); and (5) the period following the International Geophysical Year. Excluding the Arctic, the territory is classified into 5 glaciological regions with a total of 2,772 glaciers covering 2,385.9 sq km. Siberian glaciers comprise 34% of all glaciers in the USSR but occupy only about 3% of the country's total glacier area. Problems arising from a study of the territory are discussed. (Josefson-USGS)
W73-14428

DATE OF MAXIMUM ADVANCE OF THE LAST GLACIATION NEAR GRODNO (O VOZRASTE MAKSIMAL'NOY STADII POSLEDNEGO OLEDENENIYA V RAYONE GRODNO),
Geografo-Ekonomicheskii Nauchno-Issledovatelskii Institut, Leningrad. (USSR).
Kh. A. Arslanov, L. N. Voznyachuk, F. Yu. Velichkevich, A. I. Zubkov, and Ye. G. Kalechits.
Akademiya Nauk SSSR Doklady, Vol 202, No 1, p 155-158, 1972. 1 fig, 1 tab, 10 ref.

Descriptors: *Glaciation, *Age, *Radioactive dating, Carbon radioisotopes, Glacial drift, Glacial

ediments, Silts, Alluvium, Terraces (Geologic), tratigraphy, Vegetation, Palynology.
dentifiers: *Grodno (USSR).

etermination of the boundary of maximum adance of the Last Glaciation near Grodno in orthwestern Belorussia was based on carbon-14 ating of plant remains from submorainal silts in e Laboratory of Geochronology at the Institute f Economic Geography, Leningrad State Univerty. Maximum advance of the Last Glaciation at estern borders of the Soviet Union occurred less an 23,000 years ago and, consequently, can be orrelated with maximum advance of the Last laciation in Western Europe, Siberia, and North merica. (Josefson-USGS)
/73-14436

IATHEMATICAL ANALYSIS OF A HEAT XCHANGE THAT CAN BE CONTROLLED BY OMPUTER (ANALYSE MATHEMATIQUE 'UN ECHANGEUR DE CHALEUR QUI CONIENT AU CONTROLE PAR ORDINATEUR),
lational Inst. of Scientific Research, Quebec.
. J. Langham.
NRS-Eau, Technical Report No 16, 1973, 40 p, 9 ab.

Descriptors: *Heat exchangers, *Temperature ontrol, *Temperature, *Control, *Snowmelt, Refrigeration, *Numerical analysis, Heat ransfer, Systems analysis, Conductivity, Atenuation, Thermal conductivity.

Laboratory experiments on melting snow require hat the temperature be maintained very accurately at 0C. A device is proposed that adjusts the temerature of the refrigerant by periodic switching of heater. Because of the cylindrical symmetry, the eriodic component in the heat transferred may be nade as small as required, while the mean rate of eating, and thus the final temperature may be ontrolled by time division. (Cantin-INRS-Eau)
W73-14470

SNOW AMOUNT IN RELATION TO STREAMFLOW AND HERBAGE PRODUCTION IN WESTERN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 03B.
W73-14479

COASTAL ICE FORMATION AND ITS EFFECT ON BEACH SEDIMENTATION,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-14573

MONROES: A TYPE OF SO-CALLED MUD VOLCANOES IN TIDAL FLATS,
Centre de Recherches Forestiere des Laurentides, Quebec.
For primary bibliographic entry see Field 02L.
W73-14580

OCEANOGRAPHY (OKEANOGRAFIYA).
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 02L.
W73-14597

GLACIER PULSATIONS AND PROBLEM OF PREDICTING THEM ON THE MEDVEZHIY GLACIER (PUL'SATSII LEDNIKOV I PROBLEMA IKH PROGNOZIROVANIYA NA PRIMERE LEDNIKA MEDVEZH'YEGO (ZAPADNYY PAMIR)),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
L. D. Dolgushin, and G. B. Osipova.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 2, p 89-98, March-April 1972. 6 fig, 1 tab, 6 ref.

Descriptors: *Glaciers, Movement, *Forecasting, Ice, *Glacial drift, Mountains, Profiles, Surveys.
Identifiers: USSR, *Medvezhiy Glacier, *Glacier surges.

Investigations were carried out on the Medvezhiy Glacier (Bear Glacier) in the Western Pamirs to study the mechanism of glacier pulsations and the possibility of predicting them. The glacier area is about 25 sq km, and the glacier tongue ranges in size from 4.8 sq km after recession to 6.2 sq km during the period of maximum expansion. Based on systematic observations of the glacier after the 1963 surge, the glacier is expected to advance again in 1974-75. (Josefson-USGS)
W73-14600

BASED ON THE EXAMPLE OF THE ZHDANOV PORT AREA (OPYT SPETSIALIZIROVANNOY KHARAKTERISTIKI GIDROLOGICHESKOGO REZHIMA NA PRIMERE RAYONA PORTA ZHDANOV),
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 04A.
W73-14632

PHYSICAL AND THERMAL PROPERTIES OF FROZEN SOIL AND ICE,
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 08D.
W73-14717

2D. Evaporation and Transpiration

EFFICIENCY OF WATER USE AS INFLUENCED BY MICROMETEOROLOGICAL AND PHYSIOLOGICAL PROCESSES,
Kansas Water Resources Research Inst., Manhattan.
E. T. Kanemasu, I. D. Teare, W. L. Powers, J. W. Sij, and L. J. Brun.
Available from the National Technical Information Service as PB-223 371, $3.50 in paper copy, $1.45 in microfiche. Project Completion Report, Contribution No. 119. July 1973. 68 p, 12 fig, 6 tab, 96 ref. OWRR A-044-KAN (2).

Descriptors: *Evapotranspiration, *Photosynthesis, *Water utilization, *Sorghum, *Antitranspirants, Wheat, Stomata.
Identifiers: Net photosynthesis, Leaf water potential, *Stomatal resistance, Open chamber system.

Water-use efficiency (net photosythesis/evapotranspiration) was studied on sorghum treated with an antitranspirant, pheylmercuric acetate. Short-term studies of 3 to 4 days post-treatment showed that water use efficiency was reduced. Results show that diffusion porometry and field chambers can be used to test other antitranspiratns applied to field-grown crops. Net photosynthesis and water use efficiency of sorghum was not significantly affected during a period of water stress. Stomatal resistance, as measured with the diffusion porometer, increased rapidly at a critical soil moisture and was concurrent with a decline in net photosynthesis. Stomatal resistance may be an indicator for irrigation scheduling. Water use efficiency was studied in awned and awnless isogenic lines of wheat. The laboratory study showed that the awnless isogenic head has a 20% greater water use efficiency than the awned.
W73-14206

ANTITRANSPIRANTS: A POSSIBLE ALTERNATIVE TO THE ERADICATION OF SALTCEDAR THICKETS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 03B.
W73-14226

WATER FLOW IN SOIL IN PRESENCE OF SOYBEAN ROOT SINKS,
Minnesota Univ., Minneapolis. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-14367

PREDICTION OF EVAPORATION FROM HOMOGENEOUS SOIL BASED ON THE FLOW EQUATION,
Agricultural Research Service, Fort Collins, Colo.
H. R. Gardner.
Soil Science Society of America Proceedings, Vol 37, No 4, p 513-516, July-August 1973. 3 fig, 3 tab, 3 ref.

Descriptors: *Evaporation, *Soil water movement, *Water loss, Diffusivity, Earth-air interfaces, Equations, Soil moisture, Soil water.
Identifiers: Soil water evaporation.

Evaporation of water from columns packed with McGrew loamy sand was measured for three different sequences of six water additions and evaporation times totaling 60 days. These treatments were: (1) equal amounts of water added and equal times evaporated, (2) equal amounts applied and varied evaporation times, and (3) various amounts applied and equal evaporation times. The average times and amounts were the same in all treatments, and the total losses were approximately the same. A solution for the diffusivity equation for soils of finite depth was used to predict the cumulative water loss for all the treatments event by event and by an averaging technique. The predicted amounts were all within 6.5% of the total cumulative evaporation. (Knapp-USGS)
W73-14421

DIERNAL SOIL-WATER EVAPORATION: CHLORIDE MOVEMENT AND ACCUMULATION NEAR THE SOIL SURFACE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
F. S. Nakayama, R. D. Jackson, B. A. Kimball, and R. J. Reginato.
Soil Science Society of America Proceedings, Vol 37, No 4, p 509-513, July-August 1973. 9 fig, 10 ref.

Descriptors: *Evaporation, *Chemical precipitation, *Soil water, Soil water movement, Water chemistry, Diurnal, Chlorides, Soil chemistry, Leaching, Mass transfer, Ion transport.

Movement and accumulation of chloride at shallow depths (0 to 9 cm) were studied in a bare soil following an irrigation. Chloride accumulation in the 0- to 0.5- and 0- to 1-cm depth increments followed a diurnal pattern but out-of-phase from the soil water content during the first few days after irrigation. The diurnal amplitude of chloride decreased with time as the soil progressively dried. At 1- to 2-cm and deeper depths, diurnal cycling of the chloride content was not measurable, whereas cycling in the water content was evident. Most of the total chloride accumulation at the shallowest depth occurred in the early stages of drying. However, chloride movement was detected as low as 4% volumetric water content or approximately -1,000 bars soil water potential. (Knapp-USGS)
W73-14422

DIURNAL SOIL-WATER EVAPORATION: TIME-DEPTH-FLUX PATTERNS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. D. Jackson, B. A. Kimball, R. J. Reginato, and F. S. Nakayama.
Soil Science Society of America Proceedings, Vol 37, No 4, p 505-509, July-August 1973. 8 fig, 6 ref.

Descriptors: *Evaporation, *Soil water movement, Drying, Air-earth interfaces, Lysimeters, Evaporimeters.

Time-depth patterns of soil water flux in the 0- to 9-cm zone of a bare field soil are described for four 24-hour periods at 3, 7, 16, and 37 days after irrigation. On day 3, the flux at 0 cm (Evaporation) dominated the flux patterns for all depths. As the soil dried, this flux decreased and those at the greater depths gradually became dominant. On all 16 days of measurement, downward flux was observed below 1 to 3 cm during several hours between sunrise and early afternoon. Only one period of downward flux was observed for day 3, but 2 to 4 periods were noted for subsequent days. These patterns demonstrate the dynamic nature of soil water flux in the surface zone of a field soil subjected to diurnally varying environmental conditions. (Knapp-USGS)
W73-14423

ECOLOGICAL RESPONSE OF THE AUSTRALIAN NATIVE SPECIES ACACIA HARPOPHYLLA AND A TRIPLEX NUMMULARIA TO SOIL SALINITY: EFFECTS ON WATER CONTENT, LEAF AREA, AND TRANSPIRATION RATE,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Cunningham Lab.
For primary bibliographic entry see Field 03C.
W73-14472

EFFECT OF SODIUM CHLORIDE SALINITY ON THE WATER BALANCE OF ATRIPLEX HALIMUS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 03C.
W73-14477

EFFECT OF CLEARCUTTING A BLACK SPRUCE BOG ON NET RADIATION,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
J. M. Brown.
For Sci. Vol 18 No 4, p 273-277. 1972.
Identifiers: Albedo, Black spruce, *Bogs, Cutting, Energy balance, Evapo transpiration, Picea-Mariana, Radiation, *Spruce, Transpiration, *Clearcutting, *Minnesota.

Net radiation measured over a black spruce (Picea mariana) stand and a clearcut strip in a northern Minnesota bog showed little difference in daytime values the first summer after logging. The second summer after logging net radiation was lower in the clearcut strip than over the black spruce stand by 14% in June and 20% in Sept. This difference was due to different surface albedos. Although more energy was potentially available for evapotranspiration in the black spruce stand, more energy was converted into sensible heat than in the clearcut strip.--Copyright 1973, Biological Abstracts, Inc.
W73-14736

SEASONAL WATER MOVEMENT IN TREE STEMS,
Forest Service (USDA), Corvallis, Oreg. Forestry Sciences Lab.
For primary bibliographic entry see Field 02I.
W73-14739

2E. Streamflow and Runoff

A SELECTED ANNOTATED BIBLIOGRAPHY ON WATER RESOURCES OF THE STATE OF WASHINGTON.
Washington State Dept. of Ecology, Olympia.
Available from the National Technical Information Service as PB-223 350, $10.50 in paper copy, $1.45 in microfiche. Water Resources Information System Bulletin No 7, 1973, 548p.

Descriptors: *Washington, *Bibliographies, *Water resources development, Algae, Administration, Columbia River, *Radioactivity, Snake River, *Thermal pollution, Water pollution.

This bibliography, containing 340 abstracts was produced by the Water Resources Scientific Information Center from its information base, comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 50,631 abstracts covering SWRA through December, 1972 (Volume 5, Number 24). Author and subject indexes are included.
W73-14201

A SELECTED ANNOTATED BIBLIOGRAPHY ON COLUMBIA AND SNAKE RIVERS.
Washington State Dept. of Ecology, Olympia.
Available from the National Technical Information Service as PB-223 351, $7.75 in paper copy, $1.45 in microfice. Water Resources Information System Bulletin No 6, 1973, 357 p.

Descriptors: *Columbia River, *Snake River, *Bibliographies, *Radioactivity, *Thermal pollution, Streamflow, Water pollution effects, Water pollution sources, Washington, Oregon, Idaho.

This bibliography, containing 238 abstracts, was produced by the Water Resources Scientific Information Center from its information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 50,631 abstracts covering SWRA through December 1972 (Volume 5, Number 24). Author and subject indexes are included.
W73-14202

WATER RESOURCES OF WISCONSIN--LAKE MICHIGAN BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14351

STATUS OF FLOOD-PLAIN MAPPING, GREATER PITTSBURGH REGION, PENNSYLVANIA, 1972,
Geological Survey, Carnegie, Pa.
For primary bibliographic entry see Field 07C.
W73-14352

HISTORIC AND JUNE 1972 FLOOD ELEVATIONS, GREATER PITTSBURGH REGION, PENNSYLVANIA,
Geological Survey, Carnegie, Pa.
For primary bibliographic entry see Field 07C.
W73-14353

INVESTIGATION OF THE NATURE OF VARIATIONS IN ANNUAL RUNOFF COEFFICIENTS IN WEST SIBERIA (ISSLEDOVANIYE PRIRODY KOLEBANIY KOEFFITSIYENTOV GODOVOGO STOKA ZAPADNOY SIBIRI),
Institute of Geography of Siberia and the Far East, Irkutsk. (USSR).
V. P. Kulish, I. P. Druzhinin, and S. D. Polisadov.
Institut Geografii Sibiri i Dal'nego Vostoka Doklady, No 29, p 34-37, Irkutsk, 1971. 4 fig, 4 ref.

Descriptors: *Runoff, *Runoff coefficient, *Annual, *Variability, Correlation analysis, Regression analysis, Evaporation, Moisture, Moisture deficit, Maps, Equations.
Identifiers: USSR, *West Siberia.

Annual runoff coefficients vary widely in years with low and high runoff. Variation coefficients of annual runoff coefficients were calculated for West Siberia for 1936-60 and a map shows the gradual increase in variation coefficients towards the south (from 0.20 to 0.60). The correlation coefficient of the relation of annual runoff coefficients to total evaporation deficit is 0.86 and correlation coefficients of the relation of annual runoff coefficients to total moisture deficit decrease from 0.98 in the north to 0.72 in the south. A gradual decrease in closeness of the relation of runoff coefficients to total moisture deficit and total moisture is observed from north to south. The regression equations obtained can be used for estimations of runoff coefficients in ungaged regions and, in some cases, for forecast purposes. (Josefson-USGS)
W73-14429

HYDROMETEOROLOGICAL INVESTIGATIONS IN KAZAKHSTAN (GIDROMETEOROLOGICHESKIYE ISSLEDOVANIYA V KAZAKHSTANE).
Kazakhskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Alma-Ata (USSR).
For primary bibliographic entry see Field 02B.
W73-14433

LASER DOPPLER VELOCITY MEASUREMENTS OF SWIRLING FLOWS WITH UPSTREAM INFLUENCE,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 08B.
W73-14571

EXPERIMENTAL STUDY OF LONGSHORE CURRENTS ON A PLANE BEACH,
For primary bibliographic entry see Field 08B.
W73-14630

WATER WAVES FROM UNDERWATER EXPLOSIONS IN SHALLOW WATER, PART II: CHARACTERISTICS OF WAVES NEAR THE SHORELINE AND METHOD OF ESTIMATING WAVE FORCES ON A VERTICAL BARRIER,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08B.
W73-14634

AIRY WAVE THEORY AND BREAKER HEIGHT PREDICTION,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar, and M. K. Gaughan.
In: Proceedings of the 13th Coastal Engineering Conference ASCE, July 10-14, 1972 Vancouver, B.C., Canada, p 405-418, 1972. 6 fig, 17 ref. NOAA SG 2-35187.

Descriptors: *Waves (Water), *Ocean waves, Lake shores, Beaches, *Coasts.
Identifiers: *Breaker height prediction, Airy wave theory, Solitary waves, *Near shore processes, *Wave forecasting.

The applicability is examined of linear Airy wave theory to evaluate wave breaker heights. A new relationship is deduced from which the breaker height can be predicted from the deep water wave parameters (wave height and wave period). The theoretical development is set forth and comparison is made with solitary wave theory. The relationship established here is successful over the entire practical range of wave steepness values. It can also replace the empirical curve given by Munk for the intermediate range of wave slope values. (Sinha-OEIS)
W73-14635

IP CURRENTS. 2. LABORATORY AND FIELD)BSERVATIONS,
iverpool Univ. (England). Tidal Inst.
). L. Inman.
ournal of Geophysical Research Vol 74, No 23, p 479-5490, October 20, 1969. 9 fig, 4 tab, 11 ref.

Descriptors: *Rip currents, *Shallow water, Waves (Water), Coasts.
dentifiers: *Near shore processes, Incident vaves, Standing edge waves, *Circulation cells, Longshore currents, *Surf zone, Cusp formation.

The nearshore circulation of water on a plane each exposed to a uniform wave train, normally ncident on the beach, was investigated experimentally in the laboratory. The incident waves generated standing edge waves on the beach of the ame frequency as the incoming waves. The interaction between these edge waves and the incident waves gave rise to steady flow patterns nearshore circulation cells) consisting of an onshore flow toward the breakers, a longshore current in the surf zone, and an offshore flow in relatively strong, narrow rip currents. The rip currents were found to occur at alternate antinodes of he edge waves, and the spacing of the rip current was therefore equal to the longshore wavelength of the edge waves. Field observations made in the Gulf of California strongly suggest that this nechanism is important on real beaches. (See also W70-01431) (Sinha-OEIS)
W73-14636

NOTE ON THE KINETIC ENERGY SPECTRUM OF COASTAL WINDS,
Oregon State Univ., Corvallis. Dept of Oceanography.
For primary bibliographic entry see Field 02B.
W73-14642

PERIODIC MOTIONS OF THE SEASONAL THERMOCLINE ALONG THE SOUTHERN CALIFORNIA COAST,
Naval Electronics Lab. Center, San Diego, Calif.
J. L. Cairns, and E. C. LaFond.
Journal of Geophysical Research Vol 71, No 16, p 3903-3915, August 15, 1966. 12 fig, 11 ref.

Descriptors: *Thermocline, *Tides, *Forecasting, *California, *Coasts, Seasonal, *Winds.
Identifiers: Diurnal oscillation, Bathythermographic data, Periodic motions.

An investigation off the southern California coast has shown that a significant part of seasonal thermocline motion is caused by wind transport. A linear relationship for this motion, which takes into account the 14- to 16-hour response time occurring between wind and depth changes, has been established. Through this relationship it is possible to compute and predict movements of the thermocline caused by the wind. Those found to occur regularly include a diurnal oscillation, an oscillation of 4 1/2-day period, and an over-all upward trend throughout the summer. Tidal thermocline oscillations were studied with the wind effects removed. It was found that during the 4 months of nearly continuous thermocline depth data the internal tide lagged the surface tide by 3 to 5 hours and averaged 4 or 5 times as great in amplitude. (Sinha - OEIS)
W73-14646

TSUNAMIS AS GEOLOGICAL AGENTS,
Western Australia Univ., Nedlands. Dept. of Geology.
P. J. Coleman.
Journal of the Geological Society of Australia, Vol 15, Part 2, p 267-273, 1968. 32 ref.

Descriptors: *Coasts, *Sediment transport, *Tsunamis, *Shallow water, Turbidity currents, Estuaries, Bays, Bathymetry.
Identifiers: Near shore processes.

When a tsunami wave series approaches and interacts with a coast, the consequent passage shorewards of great volumes of water and their invasion of the land, especially within bays and up river valleys, results in the disturbance of existing sediment and the removal seawards of land debris and coastal and shallow-water marine sediments. Tsunami action builds up sequences of peculiar sediments in shallow water; it at least assists in the formation and maintenance of submarine canyons and, through them, produces turbidity currents of a particularly powerful kind. Tsunami action may explain many puzzling sedimentary phenomena, for example, sudden and drastic changes in nearshore bathymetry; the formation of chaotic sediments such as some paraconglomerates and edgewise conglomerates. It offers solutions to problems arising from the study of turbiditic sequences, both modern and ancient. (Sinha - OEIS)
W73-14648

NOTE ON SOME REYNOLDS STRESS EFFECTS OF INTERNAL WAVES ON SLOPES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
C. Wunsch.
Deep-Sea Research Vol 18, p 583-591, 1971. 2 fig, 11 ref. Nonr-1841 (74), Nonr-3963 (31).

Descriptors: *Coasts, Beaches, *Mixing, Mathematical models, *Interal waves, *Waves (Water).
Identifiers: *Reynolds stress effects, Shoaling beaches, Longshore geostrophic flow, Bermuda, Isopycnals, *Beach slope, Momentum flux, Eulerian flow.

When two-dimensional internal waves encounter a shoaling region, the second order mass and momentum flux carried by the waves must be re-adjusted if no mixing occurs. The re-adjustment occurs by a 'set-up' and 'set-down' of the mean isopycnals generating a second order mean Eulerian flow to cancel the Stokes drift velocity. Since the effects of Coriolis forces in an infinite flat bottomed channel are analogous to buoyance forces on a sloping bottom, rotation is easily taken into account, however the problem is degenerate to an arbitrary long-shore geostrophic flow. (Sinha - OEIS)
W73-14649

CHANGES IN THE COMPONENTS OF WAVES WHEN REACHING SHALLOW WATER, (IZMENENIYE ELEMENTOV VOLN PRI IKH VYKHODE NA MELKOVOD'YE),
State Oceanographic Inst., Moscow (USSR).
I. S. Brovikov.
Available from the National Technical Information Service as AD-636 218, $3.00 in paper copy, $1.45 in microfiche. Trans. from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, Vol 50, p 27-32, 8 p, 4 ref, 1960. Naval Oceanographic Office, Washington, DC Report No Trans-235, 1966.

Descriptors: *Waves (Water), *Shallow water, *Beaches, *Coasts.
Identifiers: *Near shore processes, *Wave deformation, Shoaling waves.

The study discusses changes in wave components as they reach shallow water. The friction of water particles against bottom and the irreversible process of the disintegration of waves resulting from the deformation of their shape are considered as the main factors that affect the changes in the components of waves as they reach shallow water. (Sinha - OEIS)
W73-14651

EXPERIMENTAL STUDY OF WATERFLOOD TRACERS,
Jersey Production Research Co., Tulsa, Okla.
R. A. Greenkorn.
Journal of Petroleum Technology, Vol 14, No 1, p 87-92, January, 1962. 4 fig, 4 tab, 28 ref.

Descriptors: *Flooding, *Injection, *Tracers, Analytical techniques, Chemical analysis, Laboratory tests, Electrolytes, Fluorescence, Radioactivity techniques, Tritium, Sands, Adsorption, Chlorides, Iodides, Nitrates, Bromides, Boron.
Identifiers: Dichromate, Thiocyanate, Breakthrough, *Elution curves.

To locate flow paths in a pilot flood, five tracers were needed that could be used together. Thirteen tracers were selected to be tested for grass adsorption on sand and ease and reliability of analysis. Flow tests of brine containing the tracers were made in a sand column containing untreated brine. Breakthrough-elution curves showed that tritiated water, and bromide, chloride, iodide, nitrate and thiocyanate ions met the requirements for ease of analysis and calculation of injected pore volume. Analytical procedures for each of the thirteen substances examined are given in an appendix. A control chart for duplicate analysis, flow test equipment and procedure and tracer theory are also discussed briefly in appendices. Any contemplated field tracer study should be preceded by laboratory tests at the anticipated flow rates, using the tracers and the porous media to be found in practice. The interpretation of tracer data from resident times of years is doubtful. (Gray-NWWA)
W73-14727

2F. Groundwater

MATHEMATICAL MANAGEMENT MODEL OF PARTS OF THE OGALLALA AQUIFER, TEXAS,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.
W73-14359

OPTIMAL IDENTIFICATION OF AQUIFER PARAMETERS IN A DISTRIBUTE SYSTEM,
California Univ., Los Angeles. Dept. of Engineering.
A. C. Lin.
Ph.D. Dessertation, 1973. 88 p, 9 fig, 10 tab, 78 ref. UCAL-WRC-W-290.

Descriptors: Aquifers, *Groundwater, *Optimization, *Base flow, *Aquifer characteristics, *Distribution systems.
Identifiers: *Quasilinearization.

The identification of parameters in an unconfined aquifer and stream interaction system is formulated in terms of an optimal control problem. The dynamics of the aquifer head, in general, is governed by a nonlinear partial differential equation of second order. Applying the maximum principle, as well as least-squares optimization, in conjunction with the technique of quasilinearization, aquifer parameters are directly identified based upon observational data at observation stations. The problem of identifying aquifer parameters being considered not only concerns the constant case, but also deals with more complex cases in which the parameters vary with space and/or time. (See also W73-14376) (Snyder-California)
W73-14375

IDENTIFICATION OF PARAMETERS IN FINITE LEAKY AQUIFER SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
M. A. Marino, and W. W-G. Yeh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 99, No. HY2, p 319-336, 5 fig, 5 tab, 15 ref. UCAL-WRC-W-290.

Descriptors: *Aquifer characteristics, Aquifers, *Groundwater, *Leakage, *Artesian aquifers, Optimization, *Algorithms, Graphical methods, Base flow.
Identifiers: Quasilinearization.

Existing methods for analyzing leaky artesian systems are graphical procedures which involve inflection-point estimation and extrapolation of field data, or superposition and matching, or both, of field data to a family of theoretical curves provided that analytical solutions are attainable. At present, there is no analytical method that treats a leaky artesian system of finite configuration. A systematic procedure for the identification of aquifer parameters in a finite leaky artesian system is developed that converts field observations directly to system parameters. The parameters to be identified are the transmissivity and storativity of the main aquifer and the leakage factor of the system. The algorithm involves finite difference approximation and quasilinearization in conjunction with least-squares optimization. Examples that demonstrate the applicability of the algorithm are presented. (See W73-14375) (Snyder-California)
W73-14376

MINERAL AND THERMAL WATERS OF CANADA,
Geological Survey of Canada, Ottawa (Ontario).
J. G. Souther, and E. C. Halstead.
Canada Geological Survey Paper 73-18, 1973. 32 p, 7 fig, 2 tab, 25 ref, $1.00. (Reprinted from Proc of 23rd International Geological Congress, Vol 19, p 225-256, Prague, 1969.)

Descriptors: *Springs, *Mineral water, *Thermal springs, *Canada, Water utilization, Economics, Recreation, Groundwater movement, Geology, Topography, Water yield, Water quality, Groundwater recharge, Water temperature, Chemical analysis, Water analysis.
Identifiers: Hot springs resorts, Health resorts, Therapeutic water.

The distribution and character of mineral and thermal waters in Canada are closely related to regional topographic and geologic features. Each of the six main physiographic regions is underlain by distinctive rock types and structures that control the circulation of groundwater and hence influence the temperature and quality of water issuing from springs and flowing wells. Most springs including all known thermal springs in Canada occur in the Cordilleran Region where high topographic relief permits deep circulation of meteoric water through local and regional flow systems and where relatively high precipitation provides an ample supply of recharge water. Nonthermal springs in other regions of Canada are mainly brine springs. They are commonly associated with Paleozoic marine sedimentary rocks, chiefly limestone, dolomite and shale interbedded with rock salt, gypsum and anhydrite, that overlap the Canadian Shield on the eastern edge of the Interior Plains and occupy sedimentary basins in the Saint Lawrence Lowland and Appalachian regions. A number of thermal springs in western Canada have been developed as recreational and health resorts and water from several nonthermal springs in Quebec is bottled and sold for therapeutic use. (Woodard-USGS)
W73-14607

THEORETICAL ANALYSIS OF THE ROLE OF SUBSURFACE FLOW IN THE GENERATION OF SURFACE RUNOFF: 2. UPSTREAM SOURCE AREAS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-14608

NEW APPROACHES TO WATER-RESOURCES INVESTIGATIONS IN UPSTATE NEW YORK,
Geological Survey, Albany, N.Y.
A. M. La Sala.
Ground Water, Vol 5, No 4, p 6-11, October, 1967. 9 fig, 3 tab, 3 ref.

Descriptors: Water sources, Water resources, Water analysis, Water quality, Chemical analysis, Streamflow, Runoff, Bank storage, Base flow, Low flow, Gaging stations, Measurement, *Groundwater recharge, Aquifer characteristics, *New York, *Surface-groundwater relationships
Identifiers: *Dissolved solids content, Lake Erie-Niagara basin, *Groundwater rating curve method.

Groundwater in New York State has been intensively studied in large basin investigations, both because of its large potential for future development and because of its interrelation with surface water resources. The latter reason is particularly important because the principal aquifers are numerous unconnected glacial sand and gravel deposits that are crossed by streams. This ground water regimen to a large degree determines the flow characteristics and water quality of streams. Conversely, streamflow data provide a convenient means of assessing ground water availability. The comprehesive program presented here has tried to use surface water data to investigate ground water systems. In this attempt to approach a study of ground water availability and quality by use of stream flow data, the relationship between stream flow quality and ground water discharge is demonstrated. A formula was developed to estimate stream flow quality in relation to quality and quantity of ground water discharge. In large-scale and comprehensive basin investigations such stream studies have also provided a practical means of estimating ground water recharge. (Hunt-NWWA)
W73-14709

SELECTED BIBLIOGRAPHY ON LABORATORY AND FIELD METHODS IN GROUND WATER HYDROLOGY,
Geological Survey, Washington, D.C.
A. I. Johnson.
Geological Survey Water-Supply Paper 1779-Z, 1964. 20 p.

Descriptors: *Groundwater, Water quality, Mathematics, Physics, Soil mechanics, Soil physics, Geology, Hydraulics, Measurement, *Bibliographies, *Reviews, *Methodology.
Identifiers: *Well construction, Soil moisture equipment.

Presented is a selected bibliography on laboratory and field methods in ground water hydrology and selected areas: mathematics, physics, soil mechanics, soil physics, geology and hydraulics. The selected topics are designed to benefit the young American or foreign national hydrologist by presenting some basic and some advanced reports on methodology, and while not designed to be all-inclusive will provide a ready guide to useful source materials. (Hunt-NWWA)
W73-14711

FACTORS THAT AFFECT WELL LIFE,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W73-14723

2G. Water in Soils

SYSTEMATIC TREATMENT OF INFILTRATION WITH APPLICATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from the National Technical Information Service as PB-223 347, $3.75 in paper copy, $1.45 in microfiche. Completion Report Series No. 50, Colorado Environmental Resources Center, Fort Collins, June 1973. 64 p, 18 fig, 1 tab, 45 ref. OWRR B-070-COLO (1). 14-31-0001-3566.

Descriptors: *Infiltration rates, Flow, Compressibility, Numerical methods, Experimental results, *Soil moisture, Porous media, *Unsaturated flow, Infiltration, *Air water interfaces
Identifiers: *Two-phase flow, Air viscous effect

Research has shown that the effects of air movement and air compressibility in soil columns are important. For soils underlain by a relatively impervious layer or by a shallow water table methods based on Richards' equation would overpredict infiltration rates by factors of 2,3 or more. Even when air compressibility effects are insignificant as in the case y of an open semi-infinite column air viscous effects are important. The formula of Green and Ampt underestimates the viscous resistance to flow behind the wetting front from 20 to 70 percent depending on soil type. The use of a theory that considers the movement of water and air in the unsaturated zone has the advantage of accountinf for observed experimental results that cannot be modeled by the one-phase flow theory. In addition the mathematical problem is actually simplified, not complicated, by the more complete approach. The fact that the problem of Green and Ampt could be solved simply in a few lines whereas it had eluded solution since 1911 is conclusive evidence. Comparison with experimental results shows that the approximations in the methods of solution yield highly accurate and practical estimates of the infiltration quantities of interest.
W73-14205

ORBITAL AND AERIAL (RB-57) PHOTOGRAPHY FOR MAPPING SOILS AND GEOLOGY IN SEMI-ARID WEST TEXAS AND EASTERN NEW MEXICO,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 07C.
W73-14328

THE NOAA/NESS PROGRAM OF REMOTE SENSING OF SOIL MOISTURE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-14330

WATER FLOW IN SOIL IN PRESENCE OF SOYBEAN ROOT SINKS,
Minnesota Univ., Minneapolis. Dept. of Soil Science.
L. M. Arya.
Available from the National Technical Information Service as PB-223 505, $11.00 in paper copy, $1.45 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 60, June 1973. 163 p, 62 fig, 8 tab, 106 ref. B-015-MINN (7). 14-01-0001-1916.

Descriptors: *Soil water movement, *Soybeans, *Evapotranspiration, Crop response, Soil profiles, Irrigation, Hydraulic conductivity, Roots.
Identifiers: *Soil water suction, Suction, Soil water depletion, Root sinks.

Water depletion patterns in the 10 to 70-cm soil depth in the root zones of two soybean varieties, 79.648 and Chippewa-64, and in a bare soil were established on Waukegan loam. Soil hydraulic properties of the soil profile, suction-water content and hydraulic conductivity-suction relationships were determined in the laboratory and supported by field measurements. Following irrigation, proportional contribution of various soil layers to the total water loss showed a downward shift with the growth state of soybeans. In general, 10-cm layers in the upper horizons constributed a major portion to the total water losses. The contribution of the 10 to 20-cm layer remained above 20 percent while that of the 50 to 60-cm layer accounted for less than 10 percent of the total water loss from the 10

to 70-cm profile. During the early stages of growth the evapotranspiration rate was 0.64 cm/day which agrees with the pan evaporation rate of 0.66 cm/day. Soil outside the 10 to 70-cm zone contributed about 0.2 cm/day towards evapotranspiration. About 55 percent of the soil volume showed root densitities of 1.0 to 2.0 cm/cm3. Generally, root density tended to be higher near the plant rows and between the 25 and 45-cm depths betlow the surface. (Walton-Minnesota)
W73-14367

WEATHERING OF BIOTITE IN SOILS OF A HUMID TROPICAL CLIMATE,
Ife Univ. (Nigeria). Dept. of Soils.
A. G. Ojanuga.
Soil Science Society of America Proceedings, Vol 37, No 4, p 644-646, July-August 1973. 2 fig, 18 ref.

Descriptors: *Weathering, *Clay minerals, *Soil formation, *Tropical regions, Kaolinite, Iron, Leaching, Clays.

Weathering of biotite was studied in saprolites derived from granite and gneiss. The soils are in the Southwestern Upland of Nigeria, an area characterized by a humid tropical climate. Kaolinite is the dominant product in the well-drained, moderately acidic, tropical soils studied. The formation of kaolinitic pseudomorphs represented a stage in the kaolinization of biotite in the soils. (Knapp-USGS)
W73-14412

INFILTRATION, HYDRAULIC CONDUCTIVITY, AND RESISTANCE TO WATER-DROP IMPACT OF CLOD BEDS AS AFFECTED BY CHEMICAL TREATMENT,
Iowa State Univ., Ames. Dept. of Soil Science.
For primary bibliographic entry see Field 04D.
W73-14413

RESPONSE OF SALINITY SENSORS TO RAPIDLY CHANGING SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. Wesseling, and J. D. Oster.
Soil Science Society of America Proceedings, Vol 37, No 4, p 553-557, July-August 1973. 5 fig, 3 tab, 12 ref.

Descriptors: *Salinity, *Electrical conductivity, *Instrumentation, Calibrations, Water chemistry, Diffusion, Diffusivity.
Identifiers: *Soil salinity meters.

A theory developed to describe the response of the sensor to changes in soil salinity is based on the assumption that diffusion of solutes into and out of the sensitive element of a salinity sensor determines its response time. This theory was experimentally verified in solution and in soils. The response of a sensor is adequately described by a single response factor. Proper use of this factor permits the actual electrical conductivity of the soil solution to be inferred from sensor readings where soil salinity changes rapidly. (Knapp-USGS)
W73-14417

A COMPARISON BETWEEN MERCURY INJECTION AND NITROGEN SORPTION AS METHODS OF DETERMINING PORE SIZE DISTRIBUTIONS,
Western Australia Univ., Nedlands. Dept. of Soil Science and Plant Nutrition.
I. D. Sills, L. A. G. Aylmore, and J. P. Quirk.
Soil Science Society of America Proceedings, Vol 37, No 4, p 535-537, July-August 1973. 3 fig, 15 ref.

Descriptors: *Porosity, *Soils, *Soil physical properties, *Pores, Porous media, Infiltration.
Identifiers: Pore geometry, Goethite.

Mercury injection and nitrogen sorption methods of pore size distribution analysis were compared on a sample of goethite using the silt-shaped pore model. Using the commonly accepted contact angle of 140 deg for mercury, the mercury pore-size distribution plot is displaced by approximately 20% in plate separation with respect to the nitrogen plot. The assumption of a contact angle of 153 deg for mercury is required to make the plots coincide. Combination of the two techniques provide a useful method of pore size distribution analysis over a large range of pore sizes. This approach is particularly appropriate to the investigation of the pore structure of soil materials. (Knapp-USGS)
W73-14418

USING INFILTRATIONS OF HEPTANE AND WATER INTO SOIL COLUMNS TO DETERMINE SOIL-WATER CONTACT ANGLES,
Florida Univ., Gainesville. Dept. of Soil Science.
B. Bahrani, R. S. Mansell, and L. C. Hammond.
Soil Science Society of America Proceedings, Vol 37, No 4, p 532-534, July-August 1973. 2 fig, 17 ref.

Descriptors: *Wetting, *Infiltration, *Wettability, *Drying, Infiltrometers, Soil physical properties, Leaching, Surface tension.
Identifiers: *Heptane, *Water-repellent soils.

A horizontal infiltration procedure using two liquids, water, and heptane was used for determining wetting soil-water contact angles in columns of water-repellent soil. The method can be used to measure contact angles less than, equal to, or greater than 90 deg and requires minimal reaction time between water and soil during experimental measurements. This technique was applied to two columns of water-repellent Pomello fine sand for six cycles of wetting, leaching, and drying. Wetting contact angles decreased from 101 deg initially to 91 deg after the six cycles. (Knapp-USGS)
W73-14419

THEORY OF A RECTANGULAR GRAVEL ENVELOPE IN DRAINAGE DESIGN,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 04A.
W73-14420

PREDICTION OF EVAPORATION FROM HOMOGENEOUS SOIL BASED ON THE FLOW EQUATION,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 02D.
W73-14421

DIERNAL SOIL-WATER EVAPORATION: CHLORIDE MOVEMENT AND ACCUMULATION NEAR THE SOIL SURFACE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02D.
W73-14422

DIURNAL SOIL-WATER EVAPORATION: TIME-DEPTH-FLUX PATTERNS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02D.
W73-14423

COINCIDENCE AND INTERFERENCE CORRECTIONS FOR DUAL-ENERGY GAMMA RAY MEASUREMENTS OF SOIL DENSITY AND WATER CONTENT,
Florida Univ., Gainesville. Dept. of Soil Science.
R. S. Mansell, L. C. Hammond, and R. M. McCurdy.
Soil Science Society of America Proceedings, Vol 37, No 4, p 500-504, July-August 1973. 3 fig, 2 tab, 11 ref.

Descriptors: *Nuclear moisture meters, *Soil moisture meters, *Gamma rays, Bulk density, Soil water, Calibrations, Instrumentation.
Identifiers: Gamma-ray spectrometers.

Volumetric water content and bulk density changes in a soil column can be simultaneously and rapidly determined from single-detector attenuation measurements of a high intensity, dual-energy beam of gamma photons. Coincidence loss due to interference between the two monoenergetic gamma rays and Compton scattering provides gamma photon intensities which are undesirably interdependent. Correction procedures are given for providing independent determinations of both 60 and 662 keV gamma ray intensities. (Knapp-USGS)
W73-14424

A MATHEMATICAL INVESTIGATION OF STEADY INFILTRATION FROM LINE SOURCES,
Colorado State Univ., Fort Collins. Dept. of Mathematics.
D. W. Zachmann, and A. W. Thomas.
Soil Science Society of America Proceedings, Vol 37, No 4, p 495-500, July-August 1973. 4 fig, 8 ref.

Descriptors: *Infiltration, *Soil water movement, *Subsurface irrigation, Evaporation, Equations, Hydraulic conductivity.

Equations which can be used in the design of subsurface irrigation systems are based on the physics of steady infiltration from a distribution of line sources which lie in a horizontal plane and are parallel and equally spaced. The analytical solution describes the flow from the line sources in the presence of uniform infiltration or evaporation at the soil surface. To increase the utility of the solution, the equations for matric flux potential and stream function are written in dimensionless form. (Knapp-USGS)
W73-14425

UNSTEADY TWO-DIMENSIONAL FLOW OF WATER IN UNSATURATED SOILS ABOVE AN IMPERVIOUS BARRIER,
Iowa State Univ., Ames. Dept. of Agronomy.
H. M. Selim, and D. Kirkham.
Soil Science Society of America Proceedings, Vol 37, No 4, p 489-495, July-August 1973. 6 fig, 20 ref.

Descriptors: *Soil water movement, *Wetting, *Unsaturated flow, *Aquicludes, Unsteady flow, Ditches, Numerical analysis, Drainage systems.

The equation describing unsteady two-dimensional water flow in unsaturated soils may be solved by use of a finite difference approximation and an alternating-direction implicity method. The two-dimensional medium is a homogeneous soil with an impervious barrier at some depth from the soil surface and having equally spaced trenches. The bottoms of the trenches are wetted at time zero and are kept at a constant 0.50 water content. The initial soil water content is 0.20. Water movement from the walls of the trenches and the soil surface is neglected. The water content at all locations in the flow medium was obtained for an Ida silt loam soil with two geometries. Near trenches with 120-cm spacing, 30-cm deep, and 30-cm wide, the wetting front reaches a depth of 30 cm in 35 min, and reaches the soil surface in 140 min. Near trenches with 60-cm spacing, 15-cm deep, and 15-cm wide, the wetting front reaches a depth of 30 cm in 45 min, and reaches the soil surface in 30 min. (Knapp-USGS)
W73-14426

CHARACTERISTICS OF THE SOIL MATRIX THAT AFFECT WATER STORAGE AND MOVEMENT,
Minnesota Univ., Minneapolis. Dept. of Soil Science.
G. R. Blake.

Available from the National Technical Information Service as PB 223 539, $3.00 in paper copy, $1.45 in microfiche. Minnesota Water Resources Research Center, Minneapolis, Mimeographed Report, August 1973. 34 p, 6 tab, 13 ref. OWRR B-015-MINN (8), 14-01-0001-1916.

Descriptors: *Soil moisture, *Soil aggregates, Crops, Water loss, *Minnesota, Hydraulic conductivity, Cultivation.
Identifiers: *Soil water suction, *Suction-water content, Soil matrix, Soil structure, Thixotropic, Colloidal surface.

Soil that consolidates under influence of water and of machines and animals is usually loosened by tillage. Soil sheared by plows or other tillage implements re-forms with time giving a more water-stable matrix. Soil matric suction increased with time in pulverized, moistened, pressed soil sealed to prevent water loss. Water stability also increased with time for simulated aggregates formed by extrusion under pressure. An interesting field application that increased the soil moisture storage reservoir was established on two sandy soil types where moisture deficiency is the principal yield-limiting factor. Treatment consisted of plowing in a nearly continuous, hot sprayed asphalt barrier 55 cm deep in two replicated experiments. The practical result of this barrier was to increase the plant available water in Zimmerman fine sand from 2.9 cm in the surface 55 cm. In Hubbard loamy coarse sand a sand-gravel layer at 25 to 50 cm itself acted as a barrier to water movement. In the Zimmerman soil it was shown that over a 3-year period supplemental water needed to keep an active growing crop could be reduced by 58% with a barrier. Probable water loss by percolation, on the other hand, would have been less than half as great with a barrier as without. (Walton-Minnesota)
W73-14467

THE RELATIONSHIP BETWEEN SOIL STRUCTURE FACTOR AND BOTH SOLUBLE AND EXCHANGEABLE SODIUM AND CALCIUM IN THE NILE ALLUVIUM OF EGYPT,
Cairo Univ., Giza (Egypt). Dept. of Soils.
A. Fathi, K. E. Khalil, and S. Milad.
United Arab Republic Journal of Soil Science, Vol II, No 2, p 213-232. 1971. 8 fig, 2 tab, 1 map, 7 ref.

Descriptors: *Soil structure, *Weathering, *Cation exchange, *Alluvium, Deposition (Sediments), Annual flood, Sodium, Calcium.
Identifiers: *Nile Valley (UAR).

Weathering factors on the igneous and metamorphic rock of the Ethiopian plateau compose the soils in much of Egypt's arable lands. They are formed through sedimentation of mud carried by annual floods, and are relatively rich in clay which is greatly affected by soluble exhangeable sodium and calcium cations. The increase in the percentages of soluble and exchangeable calcium increases the soil structure factor, while the increase in both soluble and exchangeable percentages of sodium lowers it. This study was conducted on 2 transects: the first crossing the Nile Delta 30 km north of the Barrage, the second crossing the Nile Valley on the western side of the stream, 12 km south of the Barrage to the borders of the Western Desert. (Bahre-Arizona)
W73-14474

EFFECT OF WASTE WATER FROM THE ASTRAKHAN' CELLULOSE AND PASTEBOARD COMBINE ON SOIL PROPERTIES (VLIYANIYE STOCHNYKH VOD ASTRAKHANSKOGO TSELLYULOZNO-KARTONNOGO KOMBINATA NA SVOYSTVA POCHV),
For primary bibliographic entry see Field 05D.
W73-14601

STUDY OF SOIL PLATICITY OVER A WIDE RANGE OF MOISTURE CONTENTS (ISSLEDOVANIYE PLASTICHNOSTI POCHV V SHIROKOM INTERVALE VLAZHNOSTI),
M. B. Minkin, A. G. Kalmykov, and N. I. Buravchuk.
Pochvovedeniye, No 10, p 121-125, October 1972. 1 fig, 1 tab, 11 ref.

Descriptors: *Soil physics, *Plasticity, *Plasticity index, *Soil moisture, *Moisture content, Soil properties, Liquid limits, Viscosity, Dispersion, Humus, Sodium, Chernozems, Chestnut soils, Curves.
Identifiers: USSR, *Rostov Oblast, Solonetzes.

Soil plasticity values determined by the cone method of Vasil'yev and the method of Volarovich increase with increasing contents of humus and exchangeable sodium and with increase in degree of disperson. Volarovich's soil plasticity index, which has a strict physical basis, can be used to describe soil physiocomechanical properties over a wide moisture range. Samples of Solonetz, Chestnut, and Chernozem soils from Rostov Oblast were used to show dependence of plasticity on certain soil properties. (Josefson-USGS)
W73-14604

DESCRIPTION OF WATER-SALT RELATIONS OF SOME SOILS IN CENTRAL CISCAUCASIA FROM LYSIMETER EXPERIMENTAL DATA (KHARAKTERISTIKA VODNO-SOLEVOGO REZHIMA NEKOTORYKH POCHV TSENTRAL'NOGO PREDKAVKAZ'YA PO DANNYM LIZIMETRICHESKIKH OPYTOV),
S. P. Sokolovskiy.
Pochvovedeniye, No 10, p 88-98, October 1972. 1 fig, 6 tab, 11 ref.

Descriptors: *Land reclamation, *Soils, *Water balance, *Salt balance, *Lysimeters, Soil water, Soil properties, Saline water, Brackish water, Freshwater, Groundwater, Water table, Crops.
Identifiers: USSR, *Ciscaucasia, Mineralization.

Lysimeter investigations in different regions of large irrigation systems in the Central Ciscaucasus are described. Investigations were conducted on calcareous Chernozems, Solonetzic Chernozems, and on Chestnut, Chernozemic, and Alluvial-Meadow soils. Chestnut and Chernozem loam soils are more rapidly salinized by mineralized groundwater (>11-12 g/liter) than clayey soils (Solonetzic Chernozems). Critical groundwater depth for different soils ranged from 0.5 m to 1.8 m, depending on soil hydrophysical properties, soil water and salt relations, groundwater mineralization, and character of land use. Plant suction increases concentration of soil solutions and accelerates soil salinization by mineralized groundwater. (Josefson-USGS)
W73-14605

2H. Lakes

ECOLOGICAL STUDIES IN THE PLANKTON OF CERTAIN FRESHWATER PONDS OF HYDERABAD-INDIA. III. ZOOPLANKTON AND BACTERIA,
Osmania Univ., Hyderabad (India). Hydrobiology Lab.
For primary bibliographic entry see Field 05C.
W73-14248

NITROGEN AND PHOSPHORUS IN A STRETCH OF THE GUADALUPE RIVER, TEXAS, WITH FIVE MAIN-STREAM IMPOUNDMENTS,
Southwest Texas State Univ., San Marcos.
For primary bibliographic entry see Field 05B.
W73-14249

THE LIMNOLOGY OF NITROGEN IN AN OKLAHOMA RESERVOIR: NITROGENASE ACTIVITY AND RELATED LIMNOLOGICAL FACTORS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-14253

THE GENERAL CIRCULATION OF WATER IN LAKE CHAD,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
J. P. Carmouze.
Cah. ORSTOM Ser. Hydrobiol. Vol 5, No 3/4, p 191-212. Illus. 1971. (English Summary).
Identifiers: *Chad (Lake Chad), Circulation, Lakes, *Sodium.

The Na content of the river waters varies according to the time they spent in the lake. It is possible by this relation to trace the general movements of the lake waters by observation of the distribution in time and space of the Na concentration. The modifications caused by the variations of other saltness factors are considered. The hydrodynamic factors are analyzed in order to explain annual water movements.-- Copyright 1973, Biological Abstracts, Inc.
W73-14279

SOURCES AND SINKS OF NITROGEN AND PHOSPHORUS: WATER QUALITY MANAGEMENT OF LAKE GEORGE (N.Y.),
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 05B.
W73-14284

PHYSICO-CHEMICAL ASPECTS OF LAKE MCILWAINE (RHODESIA), A EUTROPHIC TROPICAL IMPOUNDMENT,
Rhodesia Univ., Salisbury. Div. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-14291

WATER RESOURCES OF WISCONSIN--LAKE MICHIGAN BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-14351

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 07B.
W73-14354

DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 07B.
W73-14356

ALGAL PHOTOSYNTHESIS, ALGAL ABUNDANCE, AND CHEMISTRY OF LAKE WATER AT FAIRMONT, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 05C.
W73-14364

EFFECT OF SILT AND SILT REMOVAL IN A PRAIRIE LAKE,
Dakota State Coll., Madison, S. Dak. Dept. Biology; and Dakota State Coll., Madison, S. Dak. Dept. of Chemistry.
For primary bibliographic entry see Field 05C.
W73-14373

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON PRIMARY PRODUCTION AND ZOOBENTHOS OF EL CAPITAN RESERVOIR, CALIFORNIA,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W73-14444

DETRITUS IN LAKE TAHOE: STRUCTURAL MODIFICATION BY ATTACHED MICROFLORA,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W73-14445

REPORT ON HALF MOON LAKE.
Half Moon Lake Restoration Committee, Eau Claire, Wis.
For primary bibliographic entry see Field 05G.
W73-14494

LABORATORY STUDY OF SEICHING INDUCED ON AN OFFSHORE SHELF,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08B.
W73-14627

SOME THREE-DIMENSIONAL EFFECTS IN SURF,
Wisconsin Univ., Madison.
R. E. Meyer, and R. B. Turner.
Journal of Geophysical Research, Vol 72, No 10, p 2513-2518, May 15, 1967. 1 fig, 7 ref, 1 append. Nonr 562 (34), Nonr 1202 (27).

Descriptors: *Surf, *Beaches, *Waves (Water), Shallow water, Hydrodynamics, Coasts, Ocean waves.
Identifiers: *Beach geometry, Swell, Near shore processes.

The asymptotic equations of surf are derived for shallow beaches with a geometry causing longshore variations in the water motion. Such surf is generally governed by three-dimensional nonlinear shallow-water equations. When the seabed profile parallel to shore is of gentler slope than the profile normal to shore, however, the asymptotic equations are shown to differ only in minor respects from those of two-dimensional surf. Such 'weakly three-dimensional' surf can be analyzed directly in terms of the results of the two-dimensional theory, and the run-up bounds of that theory are extended accordingly. (Sinha-OEIS)
W73-14662

PLAN GEOMETRY OF HEADLAND-BAY BEACHES,
Virginia Polytechnic Inst., Blacksburg. Dept. of Geological Science.
W. E. Yasso.
Journal of Geology, Vol 73, No 5, p 702-714, September 1965. 6 fig, 8 ref.

Descriptors: *Beaches, *Sediment transport, Sedimentation, *Waves (Water), Coasts.
Identifiers: *Headland-bay beaches, Near shore processes, Geometry, Wave refraction, Wave train diffraction, *Coastal geomorphology.

A 'headland-bay' beach is defined as a beach lying in the lee of a headland subjected to a predominant direction of wave attack. Such beaches characteristically have a seaward-concave plan shape resulting from erosion caused by refraction, diffraction, and reflection of waves into the shadow zone behind the headland. Tide-induced currents have no direct effect on the plan shape of headland-bay beaches. Increasing radius of plan curvature with distance from the headland suggested testing the logarithmic spiral, r ± e theta cot alpha, as an approximation to the shape of headland-bay beaches. Four natural beaches were selected for testing goodness of fit to the log-spiral approximation: Spiral Beach, Sandy Hook, New Jersey; Halfmoon Bay Beach, California; Drakes Beach and Limantour Spit Beach lying along the Drakes Bay shoreline to the north of San Francisco, California. Published maps were used as a source of data on shoreline shape except for Spiral Beach which was mapped by the writer using engineer's transit in a longitudinal survey technique. An IBM 7090 computer was programmed to generate a best fitting log-spiral to each shoreline curve. Results ranged from excellent to good with the best fit being to Spiral Beach curvature, for which mean squared error in length of the log-spiral radius vector was only 0.82 feet squared. Constant spiral angle, a, ranged between 41.26 deg and 85.64 deg. Centers for three of the best fitting log-spirals lay in close proximity to the shoreward portion of each headland. (Sinha-OEIS)
W73-14663

EFFECT OF PARTICLE SIZE AND DISTRIBUTION ON STABILITY OF ARTIFICIALLY FILLED BEACH PRESQUE ISLE PENINSULA PENNSYLVANIA,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W73-14664

FOOD HABITS OF THE COHO SALMON, ONCORHYNCHUS KISUTCH, IN LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Dept. of Zoology.
M. A. Harney, and C. R. Norden.
Trans Wis Acad Sci Arts Lett, 60, p 79-85, 1972, Illus.
Identifiers: *Coho salmon, *Food habits, Insects, *Lake Michigan, Oncorhynchus-kisutch, Salmon, Smelt, Stickleback.

The stomach contents of 36 coho salmon, O. kisutch, taken from southern Lake Michigan were examined. The contents were identified and numerical and volumetric methods were used to analyze the data. The results indicated that the coho salmon in Lake Michigan is primarily piscivorous. Fish comprised 96.9% by volume of the coho's diet and the alewife accounted for 62% of the total stomach contents. Other items included in the coho's diet were smelt, stickleback and insects.--Copyright 1973, Biological Abstracts, Inc.
W73-14746

2I. Water in Plants

FINAL REPORT ON DRIFT STATION BIOLOGY: ZOOPLANKTON TAXONOMY AND SORTING PROGRAMS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
H. R. Fernandez.
Available from the National Technical Information Service as AD-756 661. January 1973. 45 p, 13 tab, 10 ref. Project No. NR 307-270. Contract No. N00014-67-A-0269-0013.

Descriptors: *Zooplankton, *Systematics, *Classification, *Ecological distribution, *Arctic Ocean, Crustaceans, Invertebrates, Sampling, Annelids, Mollusks, Marine animals, Animal groupings, Arctic, Copepods, Spatial distribution, Methodology, Jelly fish, Amphipoda, Gastropods, Life cycles, Animal growth, Isopods.
Identifiers: *Taxonomic guides, Vertical distribution, Sample preservation, Chaetognaths, Tunicates, Nemerteans, Macroinvertebrates, Ctenophora, Coelenterates, Calanoida, Sample preparation, Appendicularians, Polychaetes, Hydrozoans, Scyphozoans, Siphonophores, Pteropods, Pelgobia longicirrata, Spiratella helicina, Lucioutia polaris, Lucicutia anomala, Lucicutia pseudopolaris, Ostracods, Conchoecia borealis maxima, Conchoecia elegans, Conchoecia skogsbergi, Conchoecia rotunda, Bathyconchoecia, Acetabulastoma arcticum, Gammarus wilkitzkii, Gammaracanthus loricatus, Calanus hyperboreus, Decapods, Euphausiids, Mysids.

The taxonomic studies of Arctic zooplankton conducted as part of the activities of the USC Arctic Project are summarized. The purposes of such studies were to (1) identify the marine fauna of the area; (2) produce taxonomic guides which would enable biologists to readily identify Arctic zooplankton; and (3) study the biology of some of the organisms, to form the basis for biochemical and physiological investigations. A list is included of the stations and the organisms identified. (Holoman-Battelle)
W73-14312

SOME ROTIFERS FROM CAMBODIA,
Lund Univ. (Sweden). Limnological Inst.
B. Berzins.
Hydrobiologia, Vol 41, No 4, p 453-459, May 30, 1973. 12 fig, 10 ref.

Descriptors: *Rotifers, *Aquatic animals, *Speciation, Invertebrates, Classification, Systematics.
Identifiers: *Cambodia, Filina camasecla cambodgensis, Lecane blachei, Anchitestudinella mekogensis, Branchionus donneri, Animal morphology.

Some species of rotifers from Cambodia are described. (Holoman-Battelle)
W73-14313

THE TESTACEA IN THE AREA OF BUSCHELBACH STATION (BIEBER/SPESSART, GERMANY), (DIE TESTACEEN IN DER UMGEBUNG DER STATION BUSCHELBACH (SPESSART/BRD)),
Salzburg Univ. (Austria). Lunz Biological Station.
H. Laminger.
Hydrobiologia, Vol 41, No 4, p 501-513, May 30, 1973. 10 fig, 8 ref.

Descriptors: *Ecology, *Systematics, *Protozoa, Dominant organisms, Sediments, Springs, Mosses, Water, Biological communities, Sampling, Aquatic animals, Invertebrates, Speciation.
Identifiers: *Testacea, Arcella spp, Centropyxis spp, Trigonopyxis arcula, Difflugia spp, Pontigulasia spp, Heleopera spp, Hyalosphenia papilio, Lesquereusia spiralis, Nebela spp, Quadrulella spp, Assulina spp, Corythion spp, Euglypha spp, Placocista spinosa, Sphenoderia spp, Tracheleuglypha dentata, Trinema spp, Valkanovia delicatula, Amphitrema flavum, Phryganella acropodia, Cyphoderia spp, Cryptodifflugia spp, Difflugiella sacculus, *Germany.

Taxonomy and ecology of Testacea in samples from Sphagnum and from sediments of a pool, some springs and small waters collected near Buschelbach (Bieber/Spessart, Germany) were studied. Eighty-nine species were found. The Euglyphidae, one of the 9 investigated families, dominated with Trinema (T. lineare, T. enchelys), Corythion (C. dubium), Assulina (A. muscorum), Euglypha (E. rotunda, E. laevis, E. cristata) and Sphenoderia (S. minuta). The Nebelidae, another of the 9 families, were also relatively frequent, especially Nebela (N. collaris-bohemica-tincta-group), Lesquereusia (L. spiralis) and Quadrulella (Qu. symmetrica). Specimens of the families Arcellidae, Centropyxidae and Difflugiidae were generally more rare. (Little-Battelle)
W73-14314

VEGETATION-TERRAIN FEATURE RELATIONSHIPS IN SOUTHEAST ARIZONA,
Oregon State Univ., Corvallis. Rangeland Resources Program.
For primary bibliographic entry see Field 07B.
W73-14336

COMPARATIVE EVALUATION OF THERMAL PROFILE DATA OF HEALTHY AND INFESTED ENGLEMANN SPRUCE,
Forest Service (USDA), Phoenix, Ariz. Bureau of Pest Control.
For primary bibliographic entry see Field 07B.
W73-14337

ENERGY BUDGET AND PHOTOSYNTHESIS OF CANOPY LEAVES,
California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung, and S. S-F. Louie.
Annals of the Association of American Geographers Vol 63, No 1, p 109-130, March 1973. OWRR B-100-CAL (3) and B-121-CAL (3). 14-31-0001-3061 and 14-31-0001-3260 Amended.

Descriptors: Distribution patterns, *Photosynthesis, *Energy budget, Temperature, *Leaves, Canopy, *Radiation, Model studies.

The relation between leaves (broad and needle leaves) in a canopy and parts of the soil-atmosphere environment is modeled and analyzed. The parameters examined are concerned with short and longwave radiation, reradiation, and latent and convectional heat fluxes at the leaf level. The resulting leaf energy budget is empirically linked to a generalized model of potential photosynthesis whose major inputs are solar radiation and leaf temperature. The predictions of the combined process-response system do not attempt to portray existing plants, but are used to infer the trend of the major forcing and response funtions of leaves in general when exposed to a great variety of environmental conditions. Leaves in the topmost canopy exhibit the highest Bowen ratios and highest potential photosynthesis, whereas the opposite is the rule among interior leaves. During the growing season many middle latitude climates show higher potential productivity than moist, tropical climates.
W73-14358

HYDROLOGIC REGIME OF CONIFEROUS BROAD-LEAVED FOREST TREES IN THE SOUTHERN MARITIME TERRITORY (GIDROLOGICHESKIY REZHIM KHVOYNO--SHIROKOLISTVENNYKH LESOV YUZHNOGO PRIMOR'YA),
Akademiya Nauk SSSR, Vladivostok. Institut Biologii.
V. I. Tarankov.
Izdatel'stvo 'Nauka', Leningrad, 1970. 120 p.

Descriptors: *Hydrologic cycle, *Water balance, *Mountain forests, *Coniferous forests, *Coniferous trees, Pine trees, Fir trees, Ash trees, Precipitation (Atmospheric), Surface runoff, Subsurface runoff, Evaporation, Transpiration, Soil water, Infiltration, Snow cover, Water equivalent, Water storage, Retention, Conservation.
Identifiers: *Maritime Territory (USSR), Pluviograms, Chronoisopleths, Topoisopleths.

Long-term (1959-65) investigations of the hydrologic regime of mountain pine, fir, and ash forest trees in the Suputinka nature preserve, occupying about 17,000 hectares in the southern part of the Maritime Territory, have shown that forest plantings have an effect on major items in the water balance. Items examined include precipitation, soil water, surface and subsurface runoff, evaporation from soil surfaces and grass cover, transpiration of tree stands, and total evaporation. To improve moisture supply and increase water yield, pine and fir trees on mountain slopes of less than 15 deg steepness should be thinned to a density of 0.5
W73-14432

THE EFFECT OF GRADUAL LEACHING ON THE GROWTH AND YIELD OF SUGAR CANE IN SALINE SOILS,
For primary bibliographic entry see Field 03C
W73-14473

SOME FACTORS INFLUENCING TOLERANCE TO MOISTURE STRESS OF THREE RANGE GRASSES,
Idaho Univ., Moscow. Forest, Wildlife and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W73-14475

WESTERN WHEATGRASS GERMINATION AS RELATED TO TEMPERATURE, LIGHT, AND MOISTURE STRESS,
Forest Service (USDA), Albuquerque, N. Mex Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W73-14481

CHEMICAL COMPOSITION OF SIX SOUTHERN GREAT PLAINS GRASSES AS RELATED TO SEASON AND PRECIPITATION,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 04A.
W73-14482

STRESS METABOLISM. II: CHANGES IN PROLINE CONCENTRATION IN EXCISED PLANT TISSUES,
Waite Agricultural Research Inst., Glen Osmond (Australia). Dept. of Plant Physiology.
For primary bibliographic entry see Field 03F.
W73-14503

STRESS METABOLISM. IV: THE INFLUENCE OF (2-CHLOROETHYL) TRIMETHYLAMMONIUM CHLORIDE AND GIBBERELLIC ACID ON THE GROWTH AND PROLINE ACCUMULATION OF WHEAT PLANTS DURING WATER STRESS,
Waite Agricultural Research Inst., Glen Osmond (Australia). Dept. of Plant Physiology.
For primary bibliographic entry see Field 03F.
W73-14505

STRESS METABOLISM. III: VARIATIONS IN RESPONSE TO WATER DEFICIT IN THE BARLEY PLANT,
Waite Agricultural Research Inst., Glen Osmond (Australia). Dept. of Plant Physiology.
For primary bibliographic entry see Field 03F.
W73-14506

EXTENT TO WHICH THE TECHNIQUE EMPLOYED FOR THE BUILDING OF THE LIPTOVSKA MARA DAM HAS INFLUENCED ORNITHOCENOSES, (IN CZECH),
Komenskeho Universita, Bratislava (Czechoslovakia).
Z. Feriancova-Masarova, and O. Ferianc.
Biologia (Bratisl), Vol 27, No 2, p 141-146. 1972. (English summary).
Identifiers: Anthropophilous, Biotypes, Birds, *Czechoslovakia (Liptovska Mara Dam), Dams, Meadows, *Ornithocenoses, Woods, *Biotopes.

Dam building brings about the development of new water biotopes with consequent changes in the original ornithocenoses. Gradual changes in bird synusiae could be seen while dam construction was still in progress, as evidenced by studies of those parts of the Liptov Basin (Czechoslovakia) that were to be submerged and form the Liptovska Mara. Two biotopes were particularly affected by the dam construction (original wet meadows and the course of the Vah river. In the ornithocenoses of the vegetation covering the shores of the reservoir and of smaller woods, there was a decrease both in the number of species and of individuals of some species and a change in the composition of the bird communities by species. The field biotope was affected only in the building site itself. Some species of anthropophilous birds disappeared.--Copyright 1973, Biological Abstracts, Inc
W73-14542

STOMATAL RESISTANCE DURING SENESCENCE OF HARDWOOD LEAVES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources
G. W. Gee, and C. A. Federer
Water Resources Research, Vol 8, No 6, p 1456-1460, December 1972. 2 fig, 12 ref. OWRR A-025-NH (1)

Descriptors: *Leaves, *Stomata, *Moisture deficit, *Hardwood, *New Hampshire, Againg (Biological), Precipitation, Plant physiology, Surveys, Methodology, Chlorophyll, Seasonal, Diurnal, Moisture content, Diffusion, Transpiration.
Identifiers: Leaf color changes.

Leaf resistance to vapor flow was measured with a diffusion porometer on hardwood trees in central New Hampshire during autumn senescence and was compared with leaf color and chlorophyll content. Daytime diffusion resistance remained at the low values found in summer (1-10 sec/cm) as long as the leaves remained green. Resistances ranged from 5 to >35 sec/cm when chlorophyll content was below 0.4 mg/g of fresh weight and leaf color was yellow green or yellow. Autumn transpiration evidently continues unabated in green leaves but declines to small values when leaves turn color. (Woodard-USGS)
W73-14543

AN ANNOTATED LIST OF FISHES FROM THE UPPER SALT RIVER, KENTUCKY,
Louisville Univ., Ky. Dept. of Biology; and Louisville Univ., Ky. Water Resources Lab.
R. D. Hoyt, S. E. Neff, and L. A. Krumholz.
Kentucky Academy of Science Transactions, Vol 31, No 3-4, p 51-63, 1970. 3 fig, 12 ref. OWRR B-005-KY (4).

Descriptors: *Fish populations, *Fish taxonomy, *Fish types, *Pre-impoundment, *Kentucky, Reservoir sites, Baseline studies, Rivers, Streams, Wildlife management, Classification, Flood control, Reservoirs, Ecology, Environmental effects.
Identifiers: *Upper Salt River (Ky).

Three flood control impoundments are scheduled for construction on the Salt River and its two tributaries in Kentucky during the 1970's. Since the impoundment of the river will create three sizable bodies of water (4000 acres each) and will cause changes in the flora and fauna and influence downstream water quality, an intensive preimpoundment survey of the Salt River has been undertaken. Information gathered in this survey will permit an accurate appraisal of the various changes that will be brought about by impoundment of portions of the river system. This annotated list describes the relative abundance and distribution of fishes in the upper Salt River in order to correlate preimpoundment conditions with later postimpoundment conditions. The 5 predominant species in the area in order of abundance were Lepomis megalotis, Pimephales notatus, Notropis ardens, Lepomis cyanellus, and Campostoma anomalum. (Woodard-USGS)
W73-14544

ORIGINS AND ECOLOGY OF THE SIERRAN ALPINE FLORA AND VEGETATION,
New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 04A.
W73-14545

THE BIOMASS, PRODUCTIVITY, AND PHYTOGEOCHEMISTRY OF THE VEGETATION OF THE BANKS OF A STREAM IN ARDENNE (THE GEMBES STREAM AT DAVERDISSE, LUXEMBOURGIAN PART OF THE ARDENNE REGION): II. PHYTOGEOCHEMICAL SURVEY, (IN FRENCH),
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
S. Denaeyer-De Smet.
Bull Soc R Bot Belg. Vol 103, No 2, p 383-396. 1970. (English summary).
Identifiers: *Phytogeochemical surveys, Alluvial vegatation, Banks, *Biomass, Chlorides, Fertility, Foliar, Geochemistry, Potassium, *Productivity, Silicon, Sodium, Soils, Streams, Surveys, *Vegetation, *Belgium.

A preliminary phytogeochemical study, based on polyelements and Na, Cl, and Si foliar analysis, was made on the riverine vegetation of the Gembes stream. Alluvial vegetation differs from more typical terrestrial vegetation by a generalized N richness and a nearly as general K poorness. Several phytochemical groups have been distinguished. High N content of the alluvial soils studied and good nitrification conditions probably account for high N level in the plants. The very coarse texture and K poorness of the soils may be considered as responsible for the very bad K plant nutrition--Copyright 1973, Biological Abstracts, Inc.
W73-14596

THE NATURAL VEGETATION OF THE SOUTHEAST SPANISH DRY AREA,
Goettingen Univ. (West Germany). Systematisch-Geobotanisches Institut.
For primary bibliographic entry see Field 04A.
W73-14677

EFFECTS OF WATER STRESS, GIBBERELLIC ACID AND 2-CHLOROETHYLTRIMETHYLAMMONIUMCHLORIDE (CCC) ON FLOWER DIFFERENTIATION IN 'EUREKA' LEMON TREES,
Hebrew Univ., Rehovoth (Israel). Dept. of Agricultural Botany.
I. Nir, R. Goren, and B. Leshem.
J Am Soc Hortic Sci. Vol 97, No 6, p 774-778. 1972. Illus.
Identifiers: Anatomy, *Chlorides, Flowers, Gibberellic-Acid, Growth, *Lemon trees, Morphology, Trees, *Water stress.

Attempts were made to identify the stage of flower differentiation of subterminal buds under water stress conditions. Anatomical and morphological studies established that flower differentiation occurs during the stress period and that the generative bud formed does not undergo flower development until water is supplied. Gibberellic acid (GA) applied under normal irrigation conditions inhibited summer flower formation even when supplied after the first stages of flower bud differentiation, and stimulated vegetative growth of either 1 or 2 dormant axillary meristems. In contrast, 2-chloroethyltrimethylammoniumchloride induced flower formation when applied by the end of Aug. to irrigated trees. Treatments with GA under water stress conditions prevented flower formation but were inactive when applied after the renewal of irrigation and beginning of anthesis.--Copyright 1973, Biological Abstract, Inc.
W73-14737

GERMINATION STUDIES ON SOME ANNUAL SPECIES FROM AN ARID REGION OF WESTERN AUSTRALIA,
Western Australia Univ., Nedlands. Dept. of Botany.
J. J. Mott.
J Ecol. Vol 60, No 2, p 293-304. 1972. Illus.
Identifiers: Annual species, Arid land, Aristida-contorta, *Australia (Murchison region), *Germination (Annualplants), Grasses, Helichrysum-cassinianum, Helipterum-craspedioides, Rain, Seasonal, Temperature.

Assessments of numbers of annual plants in the arid Murchison Region showed a marked seasonal variation in floral composition. Summer rain produced a predominance of grasses, while winter rains resulted mainly in the growth of dictyledons. Incubation of topsoil under warm conditions yielded flora of a summer type, while cooler conditions resulted in germination of typical winter vegetation. Determination of the germination characteristics of Aristida contorta, Helipterum craspedioides and Helichrysum cassinianum, indicates that the control of seasonal germination may be at first due to dormancy of the young seed of each species, and subsequently to temperature requirements. Germination of these species may be controlled by the necessity of the surface seed to remain moist for some time before germinating so that a heavy rain is required for germination and establishment.--Copyright 1973, Biological Abstracts, Inc.
W73-14738

SEASONAL WATER MOVEMENT IN TREE STEMS,
Forest Service (USDA), Corvallis, Oreg. Forestry Sciences Lab.
P. W. Owston, J. L. Smith, and H. G. Halverson.
For Sci. Vol 18, No 4, p 266-272. 1972. Illus.
Identifiers: Abies-magnifica, Forests, Phosphorus-32, *Pinus-contorta, Seasonal, Transpiration, *Tree stems, Water movement, *California, *Fir.

Water movement in boles of 60-yr-old lodgepole pine (Pinus contorta Dougl.) and red fir (Abies magnifica A. Murr.) in the Sierra Nevada of California was estimated by monitoring the ascent of 32p injected into small roots. Daytime rates of ascent for both species was 12-84 cm/hr in summer. No movement occurred in lodgepole pine during winter. Winter rates for red fir averaged 0.4-1.4 cm/hr. In Oct., volume of daytime water movement was estimated to be 1.3-5.3 1/hr in boles of individual trees. The technique may be used to estimate transpiration from a forest area. Expanding the volume of water transport to a hypothetical hectare of forest gave a transpiration rate of 0.16 cm/day in Oct.--Copyright 1973, Biological Abstracts, Inc.
W73-14739

PREDICTION OF SITE INDEX OF LODGEPOLE PINE FROM SELECTED ENVIRONMENTAL FACTORS,
Colorado State Univ., Fort Collins. Dept. of Forest Science.
E. W. Mogren, and K. P. Dolph.
For Sci. Vol 18, No 4, p 314-316. 1972.
Identifiers: Annual, Environmental factors, Moisture, Particle size, *Pine (Lodgepole), Pinus-contorta, Precipitation, Prediction, *Site index, Soils, Solum, Stoniness, *Colorado, *Wyoming.

Site index and selected soil, climatic, and topographic characteristics were recorded for 72 1/4 acre plots in well-stocked, even-aged lodgepole pine (Pinus contorta Dougl.) stands in north-central Colorado and south-central Wyoming. Within the range of the area examined, site index can be estimated using 4 environmental variables: percent of soil particles larger than 0.25 mm in diameter in the A horizon; total solum depth in inches; estimated percent of surface stoniness; and average annual percipitation in inches. The prediction equation derived from multiple regression analysis accounted for 78% of the variance in site index, with most variation (58%) due to particle size.--Copyright 1973, Biological Abstracts, Inc.
W73-14740

FOOD AVAILABILITY AND CONSUMPTION BY YOUNG CONNECTICUT RIVER SHAD ALOSA SAPIDISSIMA,
Holyoke Community Coll., Mass. Dept. of Biology.
R. C. Levesque, and R. J. Reed.
J Fish Res Board Can, Vol 29, No 10, p 1495-1499, 1972, Illus.
Identifiers: Alosa-sapidissima, *Connecticut River, Crustaceans, Food habits (Fish), Insects, Larvae, Rivers, *Shad, Tendipedid, Trichoptera.

Food habits of young A. sapidissima were studied in the Connecticut River above Holyoke, Massachusetts in 1969. Diurnal feeding data revealed a peak in stomach content volume at 8:00 PM during midsummer. Larval shad fed mainly on aquatic crustaceans and tendipedid larvae and pupae. Juveniles ingested the most abundant organisms: crustaceans, tendipedid larvae and pupae, hydropsychid larvae and adult insects. Electivity data indicated positive selection for tendipedid pupae and crustaceans and negative selection for hydropsychid larvae and tendipedid larvae. Selection of Trichoptera larvae by young shad in significant amounts was documented.--Copyright 1973, Biological Abstracts, Inc.
W73-14743

SOIL AERATION AND SITKA SPRUCE SEEDLING GROWTH IN PEAT,
Northern Forest Research Center, Edmonton (Alberta).
J. C. Lees.
J Ecol, Vol 60, No 2, p 343-349, 1972, Illus.
Identifiers: Diffusion, Growth, Oxygen, *Peat, Picea-sitchensis, Seedlings, Sitka spruce, *Soil aeration, *Spruce, Sulfides.

A 30 deg slope was created in deep peat in situ and extended up from the water-table at 91 cm depth to 46 cm above ground surface level. Rows of 8-wk-old Sitka spruce (Picea sitchensis (Bong.) Carr.) seedlings in plastic tube containers were planted along the gradient from 0-137 cm above water-level. At 5-7 weekly intervals, during a 4-mo. growing season, soil aeration was assessed along the slope by means of a polarographic technique to determine oxygen diffusion rates (O.D.R.). A soil aeration gradient was sustained throughout the season from the water-level to the top of the slope. Seedling height growth and oven-dry weights measured at the end of the growing period closely followed the soil aeration gradient. Sulfide concentrations at the poorly aerated lower end of the slope may have contributed to mortality among seedlings there. Seedling roots did not emerge from the containers into the pea until a level of 51-61 cm above water and an O.D.R. of c. 4 x 10-8g O2/cm2/min were reached. At the top of the slope, where O. D. R. increased to c. 10-15 x 10-8 g O2/cm2/min, the seedlings made satisfactory shoot and root growth.--Copyright 1973, Biological Abstracts, Inc.
W73-14744

A CIRCUIT FOR A SELF-TIMING STOMATAL DIFFUSION POROMETER,
New South Wales Inst. of Technology, Sydney (Australia). School of Life Sciences.
P. Kenny, and P. J. McGruddy.
Agric Meteorol, Vol 10, No 4/5, p 393-399, 1972, Illus.
Identifiers: Humidity, *Measurement, *Porometer, *Stomatal diffusion.

Current stomatal diffusion porometers generally involve the measurement with stop-watch of the time taken for the cup humidity to increase from one given value to another while the cup is clamped on a leaf. The necessity of closely observing the meter movement while simultaneously holding the porometer head and circuit box, operating the stop-watch and shading the leaf leads to a degree of operator inconvenience. A circuit has been developed which automatically records this time on a digital counter and allows wide adjustment of the humidity range scanned. Facilities for measuring leaf and cup temperature and their difference are also incorporated. The instrument is battery operated and portable.--Copyright 1973, Biological Abstracts, Inc.
W73-14747

2J. Erosion and Sedimentation

AQUATIC SEDIMENTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05C.
W73-14265

EVALUATION OF ERTS-1 IMAGERY FOR AN INVENTORY OF POST-1890 ACCELERATED EROSION,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 07C.
W73-14329

RUNOFF, EROSION, AND TILLAGE EFFICIENCY ON GRADED-FURROW AND TERRACED WATERSHEDS,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
For primary bibliographic entry see Field 04D.
W73-14410

WATER YIELD AND EROSION RESPONSE TO LAND MANAGEMENT,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
For primary bibliographic entry see Field 04D.
W73-14411

INFILTRATION, HYDRAULIC CONDUCTIVITY, AND RESISTANCE TO WATER-DROP IMPACT OF CLOD BEDS AS AFFECTED BY CHEMICAL TREATMENT,
Iowa State Univ., Ames. Dept. of Soil Science.
For primary bibliographic entry see Field 04D.
W73-14413

RELATIVE DETACHABILITY OF SOIL PARTICLES BY SIMULATED RAINFALL,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
E. E. Farmer.
Soil Science Society of America Proceedings, Vol 37, No 4, p 629-633, July-August 1973. 3 fig, 4 tab, 12 ref.

Descriptors: *Soil erosion, *Impact (Rainfall), *Overland flow, Rainfall, Energy, Erosion, Rainfall intensity, Simulated rainfall, Particle size.
Identifiers: Splash erosion.

Disturbed surface soil masses of two coarse-grained granitic soils and a single fine-textured clay soil were subjected to simulated rainfall. The relative detachability of 11 soil-size fractions was determined by comparing the proportion of a given size fraction in the pretreatment soil mass with the proportion of that size fraction in the splashed soil. Tests were conducted under two levels of rainfall intensity, three degrees of slope steepness, and in the presence or absence of overland flow. Effects of rainfall intensity and slope steepness were small. Overland flow had a pronounced effect on particle detachment resulting from raindrop impact. Without overland flow, soil particle sizes in the range of 110-1,450 micrometers were most susceptible to detachment by raindrop impact. With overland flow, the susceptible size range was 219-2,034 micrometers. (Knapp-USGS)
W73-14414

THE PROBLEM OF ASSESSING THE EROSIVE POWER OF RAINFALL FROM METEOROLOGICAL OBSERVATIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
P. I. A. Kinnell.
Soil Science Society of America Proceedings, Vol 37, No 4, p 617-621, July-August 1973. 1 fig, 6 tab, 26 ref.

Descriptors: *Soil erosion, *Impact (Rainfall), Rainfall, Energy, Erosion, Rainfall intensity.

A number of rainfall parameters are used as bases for indexes of erosivity. Values for three such parameters--momentum, kinetic energy, and kinetic energy per unit horizontal area of the drop--were calculated from drop-size data. Relationships between rainfall intensity and the parameters were developed. Both raintype and geographic location influenced the parameter values. This suggests that the detachment ability of rainfall, at a given rainfall intensity, may vary between raintypes and geographic locations. However, the degree and direction of the influence depended on which parameter was being considered. The ordering of five raintypes at Miami, Florida, determined by values obtained at given rainfall intensity from the intensity-parameter regressions for momentum and kinetic energy was reversed for kinetic energy per unit horizontal area of the drop. Therefore, in the absence of data on the rate of soil detachment, it is not possible to classify the raintypes at a geographic location according to their detachment power. Rainfall parameters may only be evaluated as indexes of the detachment power of rainfall if they are determined directly and simultaneously with soil loss, and provided that the influence of runoff on soil loss is taken into account. (Knapp-USGS)
W73-14415

CHANGES IN BEACH PROFILES AT CHEDABUCTO BAY, NOVA SCOTIA, FOLLOWING LARGE-SCALE REMOVAL OF SEDIMENTS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Geoscience Center.
E. H. Owens, and G. Drapeau.
Canadian Journal of Earth Sciences, Vol 10, No 8, p 1226-1232, August 1973. 3 fig, 9 ref.

Descriptors: *Beach erosion, *Beaches, Sediment transport, Sedimentation, Oil spills, *Canada, Profiles, Surf, Pollution abatement.
Identifiers: *Chedabucto Bay (N.S.).

The effects of sediment removal on three beaches were monitored during a 1-year period following attempts to clean up an oil spill in Chedabucto Bay, Nova Scotia. Profiles of these beaches are compared with those surveyed on a high energy beach on Crichton Island which was not affected by cleaning operations. It is apparent on beaches affected by cleaning operations that sediments removed from areas beyond the limit of normal wave action have not been replaced. Excessive sediment removal can seriously alter the equilibrium of a beach and this was demonstrated by a 20-m retreat of the beach crest at the eastern end of Indian Cove. (Knapp-USGS)
W73-14549

ADVANCES IN NEAR-SHORE PHYSICAL SEDI MENTOLOGY: A SELECTIVE REVIEW,
Florida State Univ., Tallahassee. Dept. of Geolo gy.
W. F. Tanner.
Shore and Beach, Vol 41, No 1, p 22-27, Apr 1973. 1 fig, 24 ref.

Descriptors: *Beach erosion, *Sedimentatio *Beaches, *Reviews, Sediment transport, Surf Waves (Water), Sediment yield

Wave energy concepts important in coastal studie are reviewed. In the general sense, coasts ma have high, moderate, low, or even zero energy Processes appear to be easier to study o moderate-to-low energy coasts. Each segment o coast is either in nonequilibrium, subequilibriu or equilibrium. Equilibrium is a more-or-less sel correcting balance among energy, sediment an three-dimensional geometry. An equilibriu beach, for example, may maintain its equilibriu geometry, and nevertheless shift its position land ward (erosion) or seaward (accretion). These case may be examples of equilibrium-of-scarcity an equilibrium-of-abundance. There is considerabl evidence that, during the last five centuries, man of the beaches of the world have changed fro abundance to scarcity. Sand budget studies in volve the determination of quantities of san eroded, moved, and deposited in a single coasta compartment or cell. On low-to-moderate energ beaches, it may be easy to balance the san budgets. A single cell may contain subcells between which leakage is rather important. Th compartments which are reasonably well isolate from each other tend to have a size which is pro portional to the general energy level. Cell bounda ries may be zero energy segments, bay heads wide inlets or estuaries, rocky headlands, or cape based sandy shoals (very large transverse bars Studies of energy partitioning show that, in a few cells which have been examined in detail, tota sediment transport absorbs a few percent of th overall wave energy available, and ne unidirectional transport (net littoral drift) absorb a few hundredths or a few tenths of one percent o total wave energy. (Knapp-USGS)
W73-14572

COASTAL ICE FORMATION AND ITS EFFEC ON BEACH SEDIMENTATION,
Western Michigan Univ., Kalamazoo. Dept. o Geology.
R. A. Davis, Jr.
Shore and Beach, Vol 41, No 1, p 3-9, April 1973 10 fig, 5 ref.

Descriptors: *Beaches, *Ice, *Beach erosion *Great Lakes, Sedimentation, Freezing, Melting Waves (Water), Surf, Ice cover, Iced lakes, Sedi ment transport, Seasonal.

Formation of coastal ice causes sudden and strik ing seasonal changes in normal coastal processes The backbeach and foreshore zone are the first t be affected as the beach freezes and an icefoo forms. At this stage, waves and currents are essen tially unaffected. As temperatures continue t decline, various forms of ice accumulate acros the nearshore zone, with large ice ridges being th most prominent features. The ice cover prevent waves and longshore currents from acting upo the beach and nearshore zone. As a result thes areas become static during the period of ice cover Initial melting and subsequent runoff produces nu merous temporary deltas, which are protecte from wave attack by the ice ridges. Ice meltin along the foreshore zone exposes small ice-pus features, large kettle-like depressions, and generally irregular shoreline. Eventually the ic ridges break up and thereby allow waves to reac the beach. In a matter of hours the beach regain its usual character and all evidence of ice cover i destroyed. (Knapp-USGS)
W73-14573

ETHOD OF RANDOMLY DISTRIBUTING RAINS FOR MICROSCOPIC EXAMINATION,
egon State Univ., Corvallis. School of Oceanog-hy.
C. Moore, Jr.
rnal of Sedimentary Petrology, Vol 43, No 3, p -906, September 1973. 1 tab, 5 ref.

scriptors: *Particle size, *Particle shape, icroscopy, Instrumentation, Laboratory tests, alytical techniques, Equipment.

e, hydrodynamically heterogeneous grains may mounted on a microscope slide in such a way t their distribution on the slide is random. The ins are settled from a well-mixed suspension o the microscope slide where they are held in ce by a thin film of gelatin. This technique al-s the investigator to use any part of the slide as epresentative subsample, and obviates the need repeated splitting of samples and the counting a very large number of grains. (Knapp-USGS) 73-14574

EXPENSIVE DUAL BEAM TURBIDIMETER,
chester Univ., N.Y. Inst. of Optics.
Lubell, T. Barry, E. Brody, and G. Hearn.
rnal of Sedimentary Petrology, Vol 43, No 3, p -903, September 1973. 4 fig, 10 ref. NSF Grant -9153.

scriptors: *Turbidity, *Measurement, *Instru-ntation, *Light penetration, Opacity, Optical perties, Sedimentology, Suspended load.
ntifiers: Turbidimeters.

dual-beam turbidimeter can be made for under 00. The light source is a 2 milliwatt helium neon er. Use of a laser eliminates the need for colli-ting optics. The light detector is a photomul-lier tube, thus permitting the measurement of v particle concentrations. The reproducibility of e transmittance is 1%. Turbidity was measured monodisperse and polydisperse particle spensions in waters; the results compared well th determinations of the turbidity made by use an optical microscope and by use of a commer-l particle analyzer. (Knapp-USGS) 73-14575

N APPRAISAL OF THE SIGNIFICANCE OF EVE INTERVALS IN GRAIN SIZE ANALYSIS OR ENVIRONMENTAL INTERPRETATION,
stitute of Oceanographic Sciences, Taunton ngland).
R. Hails, B. Seward-Thompson, and L. mmings.
urnal of Sedimentary Petrology, Vol 43, No 3, p 9-893, September 1973. 1 fig, 1 tab, 11 ref.

escriptors: *Particle size, *Sedimentology, edimentation, *Statistical methods, Sediment nsport, Provenance, Sieve analysis.

program which uses all available data from stan-rd sedimentological analyses, regardless of the i interval, and which computes statistical rameters by direct integration of a linear ap-oximation to the cumulative curve was reviewed r its use in conjunction with sieve intervals in ain size analysis for interpretation of sedimenta- environments. The 0.25 phi interval produces ore accurate and more meaningful results unless ta can be obtained for values smaller than this terval. Although fitting a higher order equation the cumulative curve would produce more con-stent results for the 0.25, 0.5 and 1.0 phi inter-ls, there is no practical or theoretical justifica-n for choosing any particular family of curves to a cumulative curve of this description. There-re, a linear approximation is justified by its com-nation of simplicity and objectivity. (Knapp-SGS) 73-14576

COMPOSITION OF SAND RELEASED FROM THREE SOURCE AREAS UNDER HUMID, LOW RELIEF WEATHERING IN THE NORTH CAROLINA PIEDMONT,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
W. R. Mann, and V. V. Cavaroc.
Journal of Sedimentary Petrology, Vol 43, No 3, p 870-881, September 1973. 5 fig, 4 tab, 22 ref.

Descriptors: *Sands, *Provenance, *Weathering, *Mineralogy, *North Carolina, Climates, Topography, Sedimentology, Leaching.

The petrographic composition of sand-size sediment released by granitic, micaceous metamorphic, and first cycle sedimentary source areas was investigated in a portion of the North Carolina piedmont province. The region is characterized by a moist climate and low relief, resulting in moderate to heavy chemical weathering of the source rocks. Despite significant variation between sample sites within source areas, as well as appreciable in situ degradation of the chemically less stable grain types, mineralogical differences between sands from the three sources can be detected. Strong over-riding composition-sediment size relationships, however, tend to obscure the differences. These size correlations, which differ between source areas, reflect a characteristic imprint of the source lithology on sands released by weathering, and may be useful in differentiating the sand's origin. (Knapp-USGS) W73-14577

THE EFFECT OF GRAIN ORIENTATION ON FOURIER SHAPE ANALYSIS,
Michigan State Univ., East Lansing. Dept. of Geology.
S. E. Tilmann.
Journal of Sedimentary Petrology, Vol 43, No 3, p 867-869, September 1973. 1 fig, 10 ref.

Descriptors: *Particle shape, *Particle size, *Fourier analysis, Sedimentology, Statistics, Statistical methods.

The Fourier shape analysis of 50 unconsolidated sand-sized quartz grains in their maximum projection plane were compared to the shape of these same grains in orientations that depart radically from the maximum projection plane. The results indicated that the shape information carried by quartz grains while in their plane of maximum projection does not differ significantly from the shape information carried by such grains while in other planes of orientation. (Knapp-USGS) W73-14578

THE PROBLEM OF BEACH CUSP DEVELOPMENT,
Glamorgan Polytechnic, Pontypridd (Wales).
A. T. Williams.
Journal of Sedimentary Petrology, Vol 43, No 3, p 857-866, September 1973. 4 fig, 2 tab, 21 ref.

Descriptors: *Beaches, *Sand waves, *Surf, Beach erosion, Sedimentary structures, Rip currents, Coasts, Waves (Water), Geomorphology.
Identifiers: *Hong Kong.

Cusp development on three Hong Kong beaches was studied during 1970-71, and measurements of cusp dimensions and sea state parameters were obtained. Grain-size distribution as well as permeability differences were found between horns and bays. There appeared to be a tentative correlation between the degree of bay exposure and cusp spacing. Statistical analysis revealed predominance of swash length in explaining cusp spacing, and this together with wave period and breaker height explained 55% of the spacing in the measured cusps. A depositional origin of horn accumulation was demonstrated by means of fluorescent tracers, and a distinction was observed between cusp development by strong swash and gentle swash. (Knapp-USGS) W73-14579

A SPECIAL MECHANISM FOR VARVE FORMATION IN A GLACIAL LAKE,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
C. I. Dell.
Journal of Sedimentary Petrology, Vol 43, No 3, p 838-840, September 1973. 1 fig, 6 ref.

Descriptors: *Varves, *Lake Superior, *Sedimentation, Pleistocene epoch, Stratigraphy, Deposition (Sediments), Diagenesis, Sedimentation rates, Carbonates, Calcite, Calcium carbonate, Leaching.

One of the major stratigraphic units in Lake Superior is a sequence of gray varved clays formed in late-glacial time. The sediment was carried into the lake by meltwater streams flowing from the region of gray calcareous tills in the northern part of the basin. During the summer when the sedimentation rate was high, the carbonates were rapidly buried and a highly calcareous layer preserved. During the winter the sedimentation rate was greatly reduced, the carbonates were partially dissolved by the cold lake water and a low-carbonate winter layer formed. (Knapp-USGS) W73-14581

PHYSICAL PROPERTIES AND SUSPENDED MATTER OF SURFACE WATERS IN THE SOUTHEASTERN ATLANTIC OCEAN,
Woods Hole Oceanographic Institution, Mass.
K. O. Emery, J. D. Milliman, and E. Uchupi.
Journal of Sedimentary Petrology, Vol 43, No 3, p 822-837, September 1973. 13 fig, 32 ref. NSF Grant GA-28193.

Descriptors: *Suspended load, *Atlantic Ocean, *Ocean currents, Ocean circulation, Productivity, Sampling, Oceanography.

Samples of suspended matter in surface waters were obtained at about 750 stations in the southeastern Atlantic Ocean. Concentrations were related to patterns of upwelling as outlined by observations of wind direction and speed, surface water temperature, salinity, and color, seabird distribution and abundance, and the surface current pattern. The suspended matter is chiefly organic in origin owing to the high productivity of upwelled water on the continental shelf and south of the Subtropical Convergence. (Knapp-USGS) W73-14582

DISTRIBUTION AND COMPOSITION OF SUSPENDED SEDIMENT IN THE BOTTOM WATERS OF THE WASHINGTON CONTINENTAL SHELF AND SLOPE,
Washington Univ., Seattle. Dept. of Oceanography.
E. T. Baker.
Journal of Sedimentary Petrology, Vol 43, No 3, p 812-821, September 1973. 4 fig, 1 tab, 27 ref. AEC Contract AT (45-1)-2225-T24.

Descriptors: *Suspended load, *Clay minerals, *Columbia River, Continental shelf, *Washington, Provenance, Sedimentology, Sedimentation, Mineralogy, Montmorillonite.
Identifiers: Chlorite.

Samples of suspended load were collected at 26 stations from the lower Columbia River and bottom waters of the adjacent continental shelf and slope during the summer and early fall of 1971. X-ray diffraction analysis shows the montmorillonite/chlorite ratio to be a useful indicator of Columbia River-derived sediments; values vary from high (>1.0) in the Columbia River and shelf

bottom waters, through moderate (0.96-0.65) in the head and upper reaches of three major submarine canyons on the slope, to low (< 0.48) in samples from the distal portions of the canyons and the open slope areas between the canyons. Physical sedimentary processes, such as differential sedimentation and resuspension result in a continually changing clay mineral composition of the suspended load as its diffuses into the coastal ocean environment. These changes in clay mineralogy are not caused by dilution of the Columbia River suspensate or transformation of the clay minerals due to reactions with seawater. (Knapp-USGS)
W73-14583

ORIGIN AND DISTRIBUTION OF SANDS AND GRAVELS ON THE NORTHERN CONTINENTAL SHELF OFF WASHINGTON,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. Venkatarathnam, and D. A. McManus.
Journal of Sedimentary Petrology, Vol 43, No 3, p 799-811, September 1973. 7 fig, 3 tab, 30 ref. USGS Contracts 14-08-0001-10924 and 14-08-0001-11995.

Descriptors: *Sands, *Gravels, *Continental shelf, *Provenance, *Sedimentation, Pleistocene epoch, Washington, Glacial drift, Littoral drift, Sedimentology, Mineralogy.

Nearshore sands on the northern Washington shelf have high percentages of clinopyroxene, garnet, and amphibole that indicate local sediment supply along the coast. Orthopyroxene, which characterizes the Columbia River sediment, does not form a significant proportion of these sands, as it does in the nearshore sands to the south, between Grays Harbor and the Columbia River. In contrast to these differences, a heavy mineral-rich zone at 44 to 51 m has relatively abundant orthopyroxene all along the shelf, especially in the southern part. This indicates that orthopyroxene-rich sediments were more abudantly supplied to the southern part of the shelf in the past, or that the northward sediment drift was stronger than at present, possibly due to the lack of headlands. The Chehalis River could have delivered considerable quantities of sediment during the Pleistocene. Glacial outwash exiting through Grays Harbor during lowered sea level supplied the gravel found on the adjacent inner, middle, and outer shelf. Except near the Columbia River where a blanket of modern silt covers the shelf, anomalously coarse deposits rich in heavy minerals are found discontinuously at depths of 18 to 33 m, 44 to 51 m, has relatively abundant orthopyroxene all along the shelf, especially in the southern part. (Knapp-USGS)
W73-14584

LONGITUDINAL RIPPLES FORMED BY OVERLAND FLOW AND TIDAL CURRENTS,
Colorado State Univ., Fort Collins. Dept. of Geology.
M. P. Mosley.
Journal of Sedimentary Petrology, Vol 43, No 3, p 795-798, September 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Ripple marks, *Overland flow, *Sheet erosion, *Waves (Water), Unsteady flow, Non-uniform flow, Soil erosion, Surf, Tides, Model studies, Hydrologic models, Sediment transport, Sedimentation, Erosion.
Identifiers: Tidal currents.

Longitudinal ripple marks similar in size and appearance to those reported on tidal mudflats developed under the influence of artificial precipitation and overland flow during an experimental study of soil erosion. They appeared to be an upslope extension of the incised channel system, accomplishing the most efficient evacuation of water from the experimental surface. The longitudinal ripples formed under overland flow tended to be more sinuous and to branch more frequently than those formed by tidal currents. In terms of fluid flow dynamics, longitudinal ripples formed under overland flow and tidal flow may be functionally similar, but environmental conditions are quite different. That these features may develop in different environments may introduce some difficulty into interpretation of such forms found in the geologic record. (Knapp-USGS)
W73-14585

EVALUATION OF A CONCEPTUAL MODEL FOR THE TRANSVERSE SEDIMENT TRANSPORT SYSTEM OF A COASTAL BARRIER CHAIN, MIDDLE ATLANTIC BIGHT,
Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences; and Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
G. L. Shideler.
Journal of Sedimentary Petrology, Vol 43, No 3, p 748-764, September 1973. 4 fig, 2 tab, 32 ref.

Descriptors: *Beaches, *Sediment transport, *Barrier islands, Particle size, Sedimentary structures, Sedimentation, Beach erosion, Surf.

Comparative size analyses of adjacent foreshore, berm, and dune sediments were conducted along a coastal barrier chain of the Middle Atlantic Bight between Cape Henry, Virginia and Cape Hatteras, North Carolina. The three genetic populations exhibit statistically significant textural differences. Their textural attributes are interpreted in terms of a proposed conceptual model for the transverse transport system of barrier sediments. During fair weather conditions, barrier sediments are subjected to environmental processes resulting in the acquisition of distinctive textural response characteristics. The foreshore population is generated largely through aqueous processes associated with the normal swash-backwash regime, with only minor response to aeolian processes; whereas the berm population is generated by high water swash-backwash regimes, and is substantially modified by subsequent aeolian processes. The dune population is generated entirely by the aeolian regime, and represents a clastic filtrate derived from adjacent berm and aeolian flat deposits. The distinctive response characteristics of the three genetic populations tend to be obliterated by interpopulation feedback, and through storm homogenization by washover fans. Characteristic textural responses appear to be determined both by the types of processes and by their relative effectiveness. (Knapp-USGS)
W73-14586

NEW METHOD OF FORECASTING MUDFLOWS FROM THUNDERSTORMS (NOVYY METOD PROGNOZIROVANIYA SELEVYKH POTOKOV PO GROZAM),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
S. S. Korzhuyev.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 2, p 99-104, March-April 1972. 1 fig.

Descriptors: *Mudflows, *Thunderstorms, *Forecasting, Cloudbursts, Precipitation (Atmospheric), Mountains, Correlation analysis, Equations.
Identifiers: USSR, *Turkmen SSR, *Kopet-Dag.

A new method is proposed for forecasting mudflows from thunderstorm runoff. On the basis of 30 years of data, a close relation is established between thunderstorms and mudflow activity in the mudflow-risk mountainous region of Kopet-Dag in southern Turkmenistan. The number of thunderstorms during this period was 377, and the number of mudflows was 291. The coefficient of correlation is 0.972 plus or minus 0.067. (Josefson-USGS)
W73-14599

BASIC PATTERNS IN THE GEOLOGIC ACTIVITY OF STREAMS IN MOUNTAINOUS AREAS (OSNOVNYEE ZAKONOMERNOSTI GEOLOGICHESKOY DEYATEL'NOSTI REK GORNYKH STRAN),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut
I. P. Kartashov
Akademiya Nauk SSSR Geologicheskiy Institut Trudy, No 245, Moscow, 1972. 184 p

Descriptors: *Geology, *Topography, *Sedimentation, *Stream erosion, *Equilibrium, Aggradation, Degradation (Stream), Abrasion, Rivers, Streams, Gradients (Streams), Meanders, Channels, Flood plains, Deltas, Alluvium, Terraces (Geologic), Mountains, Profiles, Mapping
Identifiers: USSR, *Yakutsk ASSR, Khabarovsk Territory, Magadan Oblast, Placers, Planation.

Geologic activity of streams is divided into 3 main stages--downcutting, aggradation, and dynamic equilibrium--and 2 transitional stages--stream abrasion (transition from downcutting to equilibrium), and floodplain constriction (transition from aggradation to equilibrium). Formation of topography, alluvium, and placers is examined, and characteristics of these processes in each stage of river development are discussed. The genetic classification of fluvial topographic forms, alluvium, and placers developed by the author reflects the dynamics of development of these formations and the interrelations between different fluvial geologic processes. Factual data for analyzing interrelationships between relief-forming and rock-forming activities of streams are based on many years of investigations of gold placer deposits in the Yakutsk ASSR, Khabarovsk Territory, and Magadan Oblast. (Josefson-USGS)
W73-14603

COASTAL MOVABLE-BED SCALE-MODEL RELATIONSHIP,
Tetra Tech, Inc., Pasadena, Calif.
E. K. Noda.
Prepared for Army, Coastal Engineering Research Center. Final Report, TETRAT-P-71-191-1, March 1971. 119 p, 36 fig, 3 tab, 20 ref, 3 append. DACW 72-70-C-0021.

Descriptors: Beaches, *Coasts, *Sediments, *Waves (Water), Littoral.
Identifiers: *Beach profiles, *Longshore bar formation, Scale models, Mass transport, Near shore processes.

The problem of determining the existence of a model law for coastal movable bed scale models is considered. An experimental program has been performed and the extensive laboratory beach profile data indicate a relationship or model law between the four basic scale ratios: the horizontal scale, vertical scale, sediment size ratio and the relative specific weight ratio. To determine the validity of the experimentally derived model law a prototype dimension beach profile is modeled in the laboratory and the results show good correlation. Since this law is fundamental to all beach profiles a 'criterion of longshore bar formation' is proposed which successfully correlates the available data on the formation of 'winter' and 'summer' type beach profiles. Recommendations are presented to optimize the practical application of scale model technology to coastal movable beds. Information is also presented on the physical and handling properties of many materials to determine their applicability as possible model sediments. Graphical forms of the experimentally derived model law are presented for efficient use. In an appended paper B. Le Mehaute presents a comparison of fluvial and coastal similitude. Le Mehaute suggests that despite the fact that the knowledge in sediment transport by wave action is less advanced than in the case of steady currents, the conditions of similitude for beaches are less stringent than for rivers. An introduction to a natural law of distortion for beaches is presented in

analogy with the Lacey condition for rivers. (Sinha-OEIS)
W73-14622

FLUME STUDIES OF THE TRANSPORT OF SEDIMENT IN ESTUARIAL SHOALING PROCESSES,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 02L.
W73-14623

AN INTRODUCTION TO COASTAL MORPHOLOGY AND LITTORAL PROCESSES,
Queen's Univ., Kingston (Ontario).
B. Le Mehaute, and A. Brebner.
Civil Engineering Report No. 14, January 1961. 46 p, 36 fig, 81 ref.

Descriptors: *Coasts, *Beaches, Erosion, Sedimentation, *Sediment transport, *Waves (Water), Seiches, Fluid mechanics, Breakwaters, *Littoral drift.
Identifiers: *Near shore processes, Equilibrium profiles, Longshore currents, Beach slope, *Coastal geomorphology, Wave refraction, Wave diffraction.

Basic mechanisms of wave induced sediment motion on shorelines subject to erosion and accretion are discussed. Attention is given to the following subjects: coastal material and origin of beaches; waves and currents affecting beaches; motion of materials and equilibrium profile of beaches in a direction perpendicular to the shoreline; and drift transportation. (Sinha-OEIS)
W73-14629

EXPERIMENTAL STUDY OF LONGSHORE CURRENTS ON A PLANE BEACH,
For primary bibliographic entry see Field 08B.
W73-14630

COASTAL PROCESSES AND BEACH EROSION,
Army Coastal Engineering Research Center, Washington, D.C.
J. M. Caldwell.
Journal of the Society of Civil Engineers, Vol 53, No 2, p 142-157, April 1966. 3 fig, 5 tab, 7 ref. (Also issued as Army Coastal Engineering Research Center R. 1-67, January 1967.)

Descriptors: Beaches, Erosion, *Beach erosion, *Coastal engineering, Ocean waves, Storms, Fluid flow, *Littoral drift, Inlets (Waterways), Shores, *Shore protection, Deposition (Sediments), *Tidal effects, Waves (Water).
Identifiers: *Near shore processes, Wave overtopping.

Fundamentals of coastal processes and their application to selected engineering problems are set forth. The beach face is an active zone with a constant shuttling of the sands back and forth along the shore. Permanent beach losses occur along most of our shores due to: (a) an excess of littoral drift leaving a given sector; (b) material lost inland by the tidal action of inlets; and (c) material pulled offshore into deep water by local storms. The first two losses are permanent losses; the third loss may or may not be permanent depending on local conditions. The continuing erosion of a beach narrows the beach to where it is extremely vulnerable to severe erosion and wave overtopping during severe storms. The proper solutions to our many shore erosion problems involve basically a quantitative evaluation of the overall processes causing the erosion followed by the development of a plan to either prevent or to compensate for these losses. (Sinha-OEIS)
W73-14633

SEA-LEVEL RISE AS A CAUSE OF SHORE EROSION,
Florida Univ., Gainesville. Coastal Engineering Lab.
P. Bruun.
Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol 88, No WW1, Proceedings paper 3065, p 117-130, February 1962. 4 fig, 14 ref.

Descriptors: *Erosion, Sea level, Shores, *Beach erosion, Geologic history, Sediment, *Littoral drift, *Florida, Coasts, Estuaries.
Identifiers: Near shore processes, Accretion, Equilibrium profile, *Beach profiles.

Geological history which points to the relationship between sea level variations and beach erosion is reviewed. Consideration is given to the equilibrium profile theory. It is suggested that a rise of 0.3 m may come in 50 to 100 years and will have serious consequences for erosion along Florida shores, because it may give rise to shoreline recessions of the order of 100 ft or more on the southwest coast. There may be a time lag between the rise of the water table and the reaction in the form of erosion. This lag is more pronounced for the gentle sloping, northeastern Florida shores, than for the steep southeastern Florida shores where reactions to fluctuations come more rapidly. These steep shores present less stability than the flat shores and any change from rising to lowering, or neutral position of the sea table seems to be reflected more rapidly in these steep-slope shores. With gentle-slope shores there may be more phase-lag between rise of sea level and erosion. This steep-slope shores with lowering of sea level may stop eroding before the gentle-slope shore slowly turns a tendency to erosion into a tendency to accretion. All this is based on the assumption that these shores are equilibium profile shores with maturity of configurative development. (Sinha-OEIS)
W73-14638

TRACING BEACH SAND MOVEMENT WITH IRRADIATED QUARTZ,
Scripps Institution of Oceanography, La Jolla, Calif.
T. K. Chamberlain.
Journal of Geophysical Research Vol 64, No 1, p 41-47, January 1969. 5 fig, 2 tab, 8 ref.

Descriptors: *Beaches, *Sediment transport, Sand, Quartz, Tracers, *Erosion, *Deposition (Sediments), California, Waves (Water).
Identifiers: Irradiated quartz sand, Radioactive tracers.

The mechanics of transportation of sand under the influence of wave action was studied using artificially induced radioactivity. A sample of naturally occurring quartz sand is taken from the area of study, subjected to slow neutron irradiation, and then reintroduced into the area. The movement of the quartz is traced by sampling the sediment on the bottom and assaying for phosphorus-32, which is the principal radio isotope formed from the slow neutron irradiation of natural quartz sands. In a field experiment, 860 g of irradiated quartz sand was reintroduced as a point source on the sea floor off Scripps Beach. The experiment showed that the dispersal of sand by wave action was more rapid than expected, and that the movement of this small amount of sand could be followed for about 7 to 24 hr. The irradiated sand was released on the bottom by divers and samples were obtained on a grid at the time intervals of 1/4, 1, 3 1/2, 7 1/2, and 24 hr, and several days later. At the point of introduction the water was 10 ft deep and the surface waves were about 1 1/4 ft high. The waves caused the sand to spread in an elliptical pattern with an elongate onshore-offshore axis. The sampling indicated that the 860 g of irradiated fine sand had been dispersed over an area of approximately three-quarters of a square mile in 24 hr. The sensitivity of detection for this experiment was approximately 1 grain of sand in 100,000. (Sinha-OEIS)
W73-14639

FLUORESCENT TRACER PARTICLE DETERMINATION OF THE SIZE-VELOCITY RELATION FOR FORESHORE SEDIMENT TRANSPORT, SANDY HOOK, NEW JERSEY,
Virginia Polytechnic Inst., Blacksburg. Dept. of Geological Science.
W. E. Yasso.
Journal of Sedimentary Petrology Vol 35, No 4, p 989-993, December 1965. 3 fig, 1 tab, 8 ref. Proj NR 388-057, Nonr 266 (68).

Descriptors: *Sediment transport, *Particle size, Ocean waves, Beaches, *New Jersey, Coasts, *Tracers.
Identifiers: *Sandy Hook (NJ), Size-velocity relations, *Fluorescent tracers, Near shore processes.

Each of four size classes of foreshore sand from Sandy Hook, New Jersey, was color coded with daylight and ultraviolet fluorescent coating material. These tracer particles were introduced at midswash line on the foreshore surface at Kingmill Beach, Sandy Hook, two hours prior to high tide. During the test Atlantic Ocean waves approaching at an angle of approximately 5 degrees to the shoreline caused 5.3-second breakers of 0.73 meter maximum height. In a time-integration procedure samples were obtained by channel sampling on the foreshore along a sampling line, transverse to the foreshore, that was established 30.5 meters downdrift from the point of introduction of tracer particles. Sub-samples of the 18 samples taken during the 49.7 minutes after marked particle introduction were examined for tracer particle content. Recovery data indicate particles in the smallest size class began arriving at sampling line 18.2 plus or minus 0.7 minutes after introduction: equivalent to 2.8 cm/sec average maximum transport velocity. Particles in the next largest size class began arriving 25.8 plus or minus 1.7 minutes after introduction: equivalent to 2.0 cm/sec average maximum transport velocity. However, a maximum number of marked particles in both size classes was found in a sample taken 42.3 minutes after introduction. Only one particle in each of the two larger size classes was recovered. Particle-recovery distribution is assumed to be influenced by sample size and total weight of particles in each size class containing marked particles. Converted particle-recovery distribution is based on weight ratio of marked particles to total particles in each appropriate size class. The data indicate an inverse size-velocity relationship prevails in beach drift transport. (SinhaOEIS)
W73-14640

TSUNAMIS AS GEOLOGICAL AGENTS,
Western Australia Univ., Nedlands. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W73-14648

BEACH CHANGES AT VIRGINIA BEACH, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
W. Harrison, and K. A. Wagner.
Available from the National Technical Information Service as AD-612 765, $3.00 in paper copy, $1.45 in microfiche. Army Coastal Engineering Research Center, Misc Paper 6-64, November 1964. 25 p, 13 fig, 12 ref.

Descriptors: Beaches, Storms, *Tidal effects, Erosion, Deposition (Sediments), *Coastal engineering, Virginia.
Identifiers: Near shore processes, *Virginia Beach, *Beach profiles.

Descriptive summary of results of repeated profiles measured daily, weekly or monthly for 4

transects is presented. The study was not intended to present definitive analysis relating wave action to adjustments in the shore profile but rather serves to show magnitude of profile variations to be expected over a period of years, seasonally, or in one case, for a single violent storm. Data are also presented and discussed relating to significance of rhythmic undulations of longshore bar-trough systems as they affect range of cut and fill along offshore profiles. (Sinha - OEIS)
W73-14652

BEACH CYCLES RELATED TO TIDE AND LOCAL WIND WAVE REGIME,
Scripps Institution of Oceanography, La Jolla, Calif.
D. L. Inman, and J. Filloux.
Journal of Geology, Vol 68, No 2, p 225-231, March 1960. 3 fig, 1 tab, 1 plate, 2 ref.

Descriptors: *Tidal effects, *Sea breezes, *Berms, *Beaches, *Erosion, *Deposition (Sediments), *Waves (Water).
Identifiers: Beach profiles, Wind waves, *Gulf of California.

Along portions of the northwestern coast of the Gulf of California the beaches exhibit a fortnightly cycle of erosion and deposition which is related to the combined effects of the tides and the waves generated by the daily 'sea breeze'. In this area the higher waters of spring tide occur during the early afternoon when the 'sea-breeze' regime is strongest. This coincidence of maximum wave intensity during the times of highest water causes the position of the beach berm to follow the elevation of the envelope of the higher high waters in a fortnightly cycle. A record of the beach cycle is preserved within the beach face by the bands of heavy minerals that are concentrated by wave action at the level of each high water. (Sinha - OEIS)
W73-14653

SIZE DISTRIBUTIONS OF MINERAL GRAINS SUSPENDED IN CHESAPEAKE BAY AND NEARBY COASTAL WATERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02L.
W73-14654

PHYSIOGRAPHICAL CONDITIONS OF THE FORMATION OF THE SEACOAST ORE FIELDS, (FIZIKO-GEOGRAFICHESKIYE USLOVIYA NAKOPLENIYA ROSSYPEY PRIBREZHNO-MORSKOGO GENEZISA),
A. A. Aksenov.
Available from the National Technical Information Service as AD-705 835, $1.45 in microfiche. Trans from Teoreticheskiye Voprosy Dinamiki Morskikh Veregov, p 92-102, 1964. 14 p, 2 fig, 8 ref. Naval Oceanographic Office, Wash. DC 20390. Report NOO-Trans-429, 1970.

Descriptors: *Littoral drift, *Coasts, Sand, Ocean waves, *Beaches, *Sedimentation, Surf, Littoral.
Identifiers: Heavy minerals, Near shore processes, Size sorting, *Mineral deposits.

By studying the facies of seacoasts, it was determined that sedimentary rocks provide the main source. The littoral drift of sediments caused by waves represents the general dynamical condition. The waves separate the heavy minerals on beaches, but the conditions of separation often change. The study of recent deposits discloses that they consist, as a rule, of transgressive layers with buried relics of accumulative forms. The latter include fields of heavy minerals. With the redistribution of detritus differentiation of the material by size and weight takes place. The assortment takes place in shallow water at the water's edge where waves are deformed or broken. The so-called surf current runs up the beach and then flows back. The surf current forms the beach layer which represents a combination of a series of transverse layers that slant seaward. The beach layer contains strata of washed-out concentrate of heavy minerals. (Sinha - OEIS)
W73-14655

SEDIMENTS OF THE JAMES RIVER ESTUARY, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point
For primary bibliographic entry see Field 02L.
W73-14656

EFFECT OF PARTICLE SIZE AND DISTRIBUTION ON STABILITY OF ARTIFICIALLY FILLED BEACH PRESQUE ISLE PENINSULA PENNSYLVANIA,
Army Coastal Engineering Research Center, Washington, D.C.
D. W. Berg, and D. B. Duane.
Available from the National Technical Information Service as AD-694 204, $3.00 in paper copy, $1.45 in microfiche. Reprint 1-69, April 1968. Pub in Proceedings of the 11th Conference Great Lakes Research, p 161-178, 1968.

Descriptors: Beaches, *Beach erosion, Lakes, *Groins (Structures), *Particle size, Sediments, Sand spits, *Coastal engineering, Distribution patterns, *Pennsylvania, *Lake Erie, Lake shores, Littoral.
Identifiers: Nearshore processes, *Presque Isle Peninsula (Penn), Beach stabilization, Artificial beach nourishment.

Presque Isle Peninsula, a sandy spit on the south shore of Lake Erie, has experienced continued erosion of its lakeside shoreline ever since first attempts to stabilize and halt its natural eastward migration. For nearly 150 years numerous structures have been built on the shoreline in attempts to slow down or halt the deterioration and migration of the Peninsula and consequent loss of valuable land. Analysis of the data indicate the test area involving coarse sand fill has undergone minimal material loss and maintained a relatively stable profile. On the basis of this experiment it is judged that definite shore stabilization occurs, with attendant benefits such as substantially reduced nourishment requirements, from the utilization of sand fill that has size characteristics superior to that originally found on an eroding beach. (Sinha-OEIS)
W73-14664

SOIL EROSION--THE UNMENTIONED POLLUTER,
Illinois State Water Survey, Urbana.
W. H. Walker.
Pollution Engineering, Vol 4, No 2, p 56-57, March-April, 1972. 1 fig.

Descriptors: *Soil erosion, *Erosion control, Check structures, Vegetation establishment, *Water pollution control, Soil conservation.
Identifiers: *Soil erosion standards, Zero tillage, *Suspended solids loads.

Soil erosion from rural areas usually remains fairly stable once agricultural land-use practices have been established. This may not be the case in urban areas because of construction. Relatively short-term soil erosion losses from construction sites during land clearing, shaping and stabilization of new surfaces may contribute significant sediment loads (up to 50 to 150 tons per acre) to water sources. Soil erosion standards in the United States generally have been established on the premise that any rate of erosion that does not harm crops or the crop land is permissible. In many states more restrictive standards do already exist but are not rigorously enforced. If these standards were enforced all farming and construction would probably be terminated. Methods of soil conservation to reduce sediment loads in construction and agriculture are discussed. (Campbell-NWWA)
W73-14720

2K. Chemical Processes

ATOMIC ABSORPTION ANALYSIS OF PHOSPHATES IN WATER,
Wisconsin Univ., Milwaukee. Dept. of Chemistry
For primary bibliographic entry see Field 05A.
W73-14223

APPLICATION OF OXINE IN THE POLAROGRAPHIC ANALYSIS OF ORGANOMETALLIC COMPOUNDS. MICRODETERMINATION OF CADMIUM, MAGNESIUM, ZINC, MANGANESE, AND COBALT,
Institut National des Sciences et Techniques Nucleaires, Saclay (France).
For primary bibliographic entry see Field 05A.
W73-14244

SEPARATION OF MOLYBDENUM FROM TUNGSTEN, VANADIUM, IRON, URANIUM AND SEVERAL OTHER INTERFERING ELEMENTS BY EXTRACTION OF ITS THIOSULPHATO COMPLEX,
Kurukshetra Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-14246

SPECTROPHOTOMETRIC DETERMINATION OF CALCIUM,
Upper Iowa Univ., Fayette.
T. S. Prokopov.
Mikrochimica Acta, No 3, p 429-434, 1973. 3 fig, 2 tab, 5 ref.

Descriptors: *Calcium, *Aqueous solutions, *Colorimetry, Absorption, *Spectrophotometry.
Identifiers: Chemical interference, Sample preparation.

A method was developed for determining calcium by a direct colorimetric method using sodium rhodizonate as a reagent. Standard solutions ranging from 2-200 ppm Ca (II) were prepared using calcium nitrate. The analytical procedure involved placing 1 ml of sample in a test tube, rendering it basic (pH 12) with sodium hydroxide, and adding 3 ml of 25 ppm rhodizonate solution. After shaking, the samples were transferred to cuvets for measurement of absorbance at 570 nm. The procedure is not laborious, eliminates interfering ions, and is convenient to use. (Little-Battelle)
W73-14251

VERSATILE COMBUSTION-AMALGAMATION TECHNIQUE FOR THE PHOTOMETRIC DETERMINATION OF MERCURY IN FISH AND ENVIRONMENTAL SAMPLES,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 05A.
W73-14271

QUANTITATIVE PERCHLORINATION OF POLYCHLORINATED BIPHENYLS AS A METHOD FOR CONFIRMATORY RESIDUE MEASUREMENT AND IDENTIFICATION.
Food and Drug Administration, Washington, D.C. Div. of Chemical Technology.
For primary bibliographic entry see Field 05A.
W73-14276

COBALT INTERFERENCE IN THE NON--STEADY STATE CLEAN WATER TEST,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 05A.
W73-14281

INTERFERENCES IN NICKEL DETERMINATIONS BY ATOMIC ABSORPTION SPECTROMETRY,
California Univ., Los Angeles. Dept. of Chemistry.
L. L. Sundberg.
Analytical Chemistry, Vol 45, No 8, p 1460-1464, July 1973. 4 fig, 2 tab, 21 ref.

Descriptors: *Nickel, *Aqueous solutions, Heavy metals, *Pollutant identification, Water analysis, Absorption.
Identifiers: *Atomic absorption spectrophotometry, *Chemical interference.

This study was undertaken to evaluate interferences from Zn, Fe (III), Cu, Co, Mn (II), and Cr (III) in the atomic absorption spectrometry of nickel. Stock solutions of all but copper were prepared by dissolving the metals in HCl and diluting with water. Copper solutions were prepared by dissolving CuCl2.2H20 in water. Interferences were studied with both oxidizing and reducing air-acetylene flames. Other variables were wavelength and burner elevation. Samples contained transition metal concentrations of 2000 ppm and 20 ppm Ni. The results show that interferences from Fe (III), Cu, Co, Mn (II), and Cr (III) are similar and are greatly influenced by observation height. Consequently, careful adjustment of this parameter can eliminate them. In a reducing flame, the Ni absorbance can be enhanced or depressed by the same concomitant, and the direction of the interferences is further dependent upon the concentration of interfering species. (Little-Battelle)
W73-14288

MICROANALYSIS WITH THE AID OF ION EXHANGE RESINS. XXVI. DETECTION OF SMALL QUANTITIES OF COPPER (II) WITH BATHOCUPROINE DISULFONATE, MIKROANALYSE MIT HILFE VON IONENAUSTAUSCHERN. XXVI NACHWEIS GERINGER MENGEN KUPFE R (II) MIT BATHOCUPROINDISULFONAT,
Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-14290

RAPID, SELECTIVE METHOD FOR LEAD BY FORCED-FLOW LIQUID CHROMATOGRAPHY,
Ames Lab., Iowa.
For primary bibliographic entry see Field 05A.
W73-14295

DIRECT DETERMINATION OF PHOSPHORUS BY ATOMIC ABSORPTION FLAME SPECTROMETRY,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-14296

ROLE OF SOLVENT EXTRACTION PARAMETERS IN GOVERNING THE POTENTIAL SELECTIVITY OF LIQUID MEMBRANE ELECTRODES,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
S. Back, and J. Sandblom.
Analytical Chemistry, Vol 45, No 9, p 1680-1684, August 1973. 4 fig, 1 tab, 19 ref.

Descriptors: *Selectivity, *Solvent extractions, *Zeta potential, Hydrogen ion concentration, Acids, Equations, Mathematical studies, Electrical properties, Membranes, *Electrodes.
Identifiers: *Membrane electrodes, Liquid membranes, Extraction coefficients, Organic solvents, Ion selective electrodes.

The relationship between solvent extraction parameters and the potential selectivity of liquid membranes has been examined. An expression for the electrode potential has been derived containing measurable solvent extraction parameters. This expression is used to compare the potential selectivity of a liquid membrane-consisting of tetraalkylammonium salts dissolved in methylene chloride-with the solvent extraction properties of the same system. The potential selectivity constant is related to the extraction constant by a square root dependence which is interpreted in terms of surface diffusion phenomena. The pH-dependence of the electrode potential in the presence of weak acids as well as the role of solvent is also examined. It is concluded that extraction processes determine the potential selectivity of liquid membranes if the extraction constants are sufficiently large and if the solvent favors the counter ions. (Holoman-Battelle)
W73-14297

ENVIRONMENTAL ANALYSIS PROBLEMS CREATED BY UNEXPECTED VOLATILE BERYLLIUM COMPOUNDS IN VARIOUS SAMPLES,
Aerospace Research Labs., Wright-Patterson AFB, Ohio.
M. S. Black, and R. E. Sievers.
Analytical Chemistry, Vol 45, No 9, p 1773-1775, August 1973. 3 tab, 7 ref.

Descriptors: *Beryllium, *Gas chromatography, *Air pollution, Public health, Digestion.
Identifiers: Sample preparation, Chemical recovery, *Orchard leaves, *Volatilization, Recovery, Biological samples, Wet digestion, Accuracy, Beryllium compounds, Ashing, Electron capture gas chromatography, GC-mass spectrometry.

Analysis of orchard leaves samples for beryllium yielded inconsistent results when the samples were prepared by different methods suggesting that volatile beryllium contents may have been present. To investigate this possibility, samples of orchard leaves and air were obtained. The orchard leaves were prepared for analysis by wet digestion in an open container, by wet digestion in a flask with a reflux condenser, and by low temperature ashing in an oxygen plasma. Air samples, which were provided by EPA's Office of Air Programs, have been collected in a sampling train consisting of an EPA sampling probe, two Millipore AA filters backed by Whatman filters in series, two water impingers in series, a dry impingers to catch water condensation, and a cold trap. Samples from each section were analyzed. All analyses were by electron capture gas chromatography. These results were compared with those obtained by GC-mass spectrometry. The results of this study indicate the existence of naturally occurring volatile beryllium compounds. The various digestion and ashing procedures of orchard leaves have shown that beryllium is lost in the vapor phase at relatively low temperatures (less than 200 C). This suggests that a considerable amount (at least 90 percent) of the beryllium in the orchard leaves may be organically bound and that it is lost upon destruction of the organic matrix unless precautions are taken. Analyses of the impinger samples show that beryllium content was much higher in the cold traps than in the water impingers in spite of the fact that the cold traps came last in the flow train. This supports the contention that volatile beryllium compounds do exist and that they are present in the vapor state in facilities where beryllium is machined. (Little-Battelle)
W73-14299

1-EPHEDRINE IN CHLOROFORM AS A SOLVENT FOR SILVER DIETHYLDITHIOCARBAMATE IN THE DETERMINATION OF ARSENIC,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-14300

PREPARATION AND PROPERTIES OF THE SULFATE ION SELECTIVE MEMBRANE ELECTRODE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
M. S. Mohan, and G. A. Rechnitz.
Analytical Chemistry, Vol 45, No 8, p 1323-1326, July 1973. 5 fig, 2 tab, 2 ref.

Descriptors: *Fabrication, Sulfates, Anions, Electrical properties, Construction, Selectivity, Nitrates, Chlorides, Bromides, Iodides, Sulfites, Hydrogen ion concentration, Physical properties, *Electrodes.
Identifiers: *Ion selective electrodes, *Membrane electrodes, *Sulfate membrane electrodes, Chemical composition, Ionic interference, Perchlorates, Orthophosphates, Sensitivity, Response time, Selectivity coefficients.

Detailed information is provided concerning the construction of sulfate selective membrane electrodes in terms of composition, membrane preparation, and electrode assembly. Special attention is given to the effect of surface treatment on electrode response and to the attainment of optimum response characteristics by conditioning. The effect of other ions on sulfate response is evaluated. (Holoman-Battelle)
W73-14301

ULTRAPURIFICATION OF WATER FOR ELECTROCHEMICAL AND SURFACE CHEMICAL WORK BY CATALYTIC PYRODISTILLATION,
Ottawa Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-14302

CORRELATION OF ENHANCEMENT OF ATOMIC ABSORPTION SENSITIVITY FOR SELECTED METAL IONS WITH PHYSICAL PROPERTIES OF ORGANIC SOLVENTS,
Murray State Univ., Ky. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-14304

ESTIMATING PRECISION FOR THE METHOD OF STANDARD ADDITIONS,
Oregon State Univ., Corvallis.
I. L. Larsen, N. A. Hartmann, and J. J. Wagner.
Analytical Chemistry, Vol 45, No 8, p 1511-1513, July 1973. 1 fig, 3 tab, 12 ref.

Descriptors: *Estimating, *Regression analysis, *Zinc, Aqueous solutions, Heavy metals, Statistical methods, Equations, Calibrations, Least squares method.
Identifiers: *Standard addition technique, *Errors, *Precision, Orchard leaves, Uncertainty, Atomic absorption spectrophotometry, Biological samples.

An estimate of the uncertainty term expected in the method of standard additions using linear regression analysis is presented. The method agrees favorably with the standard deviation for values which are not corrected for a blank as well as with the population standard error of difference for corrected samples. Analysis for zinc in an environmental sample yielded a concentration range within the expected value. (Little-Battelle)
W73-14305

WATER CHARACTERISTICS,
Maine Univ., Orono.
For primary bibliographic entry see Field 05A.
W73-14316

CONTINUOUS MONITORING, AUTOMATED ANALYSIS, AND SAMPLING PROCEDURES,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05A.
W73-14318

SOME INSTRUMENTS AVAILABLE NOW FOR THE MEASUREMENT OF WASTEWATER PARAMETERS,
Ionics, Inc., Watertown, Mass. Instrument Div.
For primary bibliographic entry see Field 05A.
W73-14321

MEASUREMENT OF ORGANIC WASTEWATER PARAMETERS,
Battelle Memorial Inst., Columbus, Ohio. Organic Chemical Div.
For primary bibliographic entry see Field 05A.
W73-14322

THE ANALYSIS OF TRITIUM OXIDE FROM SELECTED AREAS OF THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05A.
W73-14362

THE APPLICATION OF GAS CHROMATOGRAPHY OF VOLATILE METAL CHELATES TO WATER ANALYSIS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. A. Minear, and C. M. Palesh.
Available from ACS-Div of Water, Air and Waste Chem., Publications Manager, Mellon Institute, 4400 Fifth Ave, Pittsburgh, Penn 15213, Price $4.00. In: Preprints of Papers Presented at 165th National Meeting of American Chemical Society, April 8-13, 1973, Dallas, Tex: American Chemical Society, Division of Water, Air and Waste Chemistry, Vol 13, No 1, Paper 29, p 13-18, 1973. 4 fig, 1 tab, 5 re

Descriptors: *Water analysis, *Chemical analysis, *Chelation, *Gas chromatography, Chromium, Beryllium, Lead, Flame photometry.
Identifiers: Atomic absorption spectrophotometry, *Metal chelates.

The use of volatile metal chelates for the determination of trace quantities of metals by gas chromatography and electron capture or mass spectrometer detection provides detectability limits as low as 0.01 micrograms per liter for chromium and beryllium. Two chelating agents, 2,2,6,6-tetramethyl-3, 5-heptanedione (piv) and trifluoracetylacetone (tfa) were tested with copper, chromium, nickel, iron, lead and aluminum. Reaction procedures tried were (1) direct aqueous extraction from buffered and unbuffered systems, (2) extraction from heated solutions, (3) extraction from an acid-methanol solution, and (4) sealed tube reactions with both aqueous solutions and crystal forms. (Knapp-USGS)
W73-14393

THE NATURE OF CHEMISTRY IN THE NATIONAL SEA GRANT PROGRAM,
National Oceanic and Atmospheric Administration, Rockville, Md.
R. B. Abel.
Available from ACS-Div. of Water, Air and Waste Chem., Publications Manager, Mellon Inst. 4400 Fifth Ave., Pittsburgh, Pa. 15213, Price $4.00. In: Preprints of Papers Presented at 165th National Meeting of American Chemical Society, April 8-13, 1973, Dallas, Tex: American Chemical Society, Division of Water, Air and Waste Chemistry, Vol 13, No 1, Paper 74, p 77-78, 1973.

Descriptors: *Grants, *Oceanography, *Water pollution control, Water resources development, Environment, Water chemistry.
Identifiers: Sea grants.

The National Sea Grant Program has adopted a program in chemistry as a result of national interest in environmental degradation. Normally, the Sea Grant Program reacts to, and awards grants to Universities in, the general area of pollution control where the project is itself related to another aspect of marine resource development. Sea Grant encompasses pollution programs ranging from estimates of trace metals in estuarine organisms and sediments, to studies of roles of benthic organisms as elements of ecological warning systems, studies of quality of water in bays and estuaries, and estimates of phosphate concentrations in industrial waste waters. The effects of chemical concentration, nutrients, and salinity generally are investigated. (Knapp-USGS)
W73-14397

WEATHERING OF BIOTITE IN SOILS OF A HUMID TROPICAL CLIMATE,
Ife Univ. (Nigeria). Dept. of Soils.
For primary bibliographic entry see Field 02G.
W73-14412

DIRECT VAPORIZATION AND QUANTIFICATION OF ARSENIC FROM SOILS AND WATER,
Texas A and M Univ., College Station. Dept. of Agricultural Analytical Services; and Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 05A.
W73-14416

RESPONSE OF SALINITY SENSORS TO RAPIDLY CHANGING SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W73-14417

SIMPLEST ORGANIC ACIDS IN GROUNDWATER OF THE LOWER VOLGA REGION (GENESIS AND POSSIBLE USE IN PROSPECTING FOR OIL) (NIZSHIYE ORGANICHESKIYE KISLOTY V PODZEMNYKH VODAKH NIZHNEGO POVOLZH'YA (GENESIS I VOZMOZHNOST' ISPOL'ZOVANIYA V NEFTEPOISKOVYKH TSELYAKH),
Nizhne-Volzhskii Nauchno-Issledovatelskii Institut Geologii i Geofiziki, Saratov (USSR).
A. S. Zinger, and T. E. Kravchik.
Akademiya Nauk SSSR Doklady, Vol 202, No 3, p 693-696, 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Geochemistry, *Organic acids, *Groundwater, *Exploration, *Oil, Oil fields, Oil wells, Natural gas, Phenols, Volatitily, Boiling, Hydrolysis, Water types, Geologic time.
Identifiers: USSR, *Volga Region, Esters.

Genetic water types ranging from low-salinity sodium bicarbonate, sodium sulfate, and magnesium chloride waters to calcium chloride brines were investigated for distribution of simplest organic acids in groundwater of the Lower Volga Region. Butyric, acetic, and formic acids were found in all waters, while propionic acid was lacking in most samples. Total concentration of volatile acids in groundwater circulating in non-oilbearing structures ranges from 0.40 to 5.0 mg/liter. Concentration of simplest organic acids in calcium chloride waters and brines of productive structures ranges from 0.65 to 45.25 mg/liter. There is a definite correlation between concentration of acids and type of hydrocarbon deposit, and a relation is established between phenol and volatile-acid concentrations in the waters. (Josefson-USGS)
W73-14434

CONCENTRATION RATIOS OF SALTS AT THE SEA SURFACE AND IN RAINWATER COLLECTED OVER THE SEA (SOOTNOSHENIYE KONTSENTRATSIY SOLEY NA POVERKHNOSTI OKEANA I V MORSKOY ATMOSFERNOY VLAGE),
Akademiya Nauk SSSR. Moscow. Institut Okeanologii
V. D. Korzh
Akademiya Nauk SSSR Doklady, Vol 202, No 2, p 322-324, 1972. 1 tab, 12 ref

Descriptors: *Geophysics, *Sea water, *Surfaces, *Rain water, *Salts, Carbonates, Sulfates, Chlorine, Evaporation, Equations
Identifiers: USSR

Rainwater collected over the sea contains all the principal salts found in seawater. Average chlorine ratios for Na and Mg in rainwater over the sea are almost identical to those in the surface film of the sea. Good agreement is also observed in the case of boron. Average chlorine ratios for Ca, K, and SO4 in rainwater are, in some instances, higher than those calculated for the surface film. Average chlorine ratios for carbonates in rainwater are much higher than calculated CO3/Cl ratios in the surface film. The chlorine ratio of surface-active components of seawater is, in the first approximation, independent of their physical and chemical properties and depends mainly on their concentration in seawater. Average chlorine ratios in rainwater collected over the sea are related to the ratios at the sea surface. Deviations from this reflect fractionation of salts from the sea in the atmosphere, depending on meteorological, geographisal, and other conditions. (Josefson-USGS)
W73-14435

SIMPLE ARRANGEMENT FOR THE DETECTION OF SULPHUR IN GAS-CHROMATOGRAPHIC ELUATES, (EINFACHE ANORDNUNG ZUM NACHIWEIS VON SCHWEFEL IN GAS-CHROMATOGRAPHISCHEN ELUATEN),
Universitaet des Saarlandes, Saarbruechen (West Germany). Institut fuer Analytische Chemie und Radiochemie.
For primary bibliographic entry see Field 05A.
W73-14438

THE SPECTROPHOTOMETRIC DETERMINATION OF PALLADIUM WITH 4- ((5-CHLORO--2-PYRIDYL)AZO)-1,3-DIAMINOBENZENE,
Government Industrial Research Inst., Nagoya (Japan).
For primary bibliographic entry see Field 05A.
W73-14440

ATOMIC ABSORPTION AND FLUORESCENCE SPECTROMETRY WITH A CARBON FILAMENT ATOM RESERVOIR. PART XIII. THE DETERMINATION OF CHROMIUM WITH A FULLY ENCLOSED ATOM RESERVOIR,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-14441

THE FLUORIMETRIC DETERMINATION OF MERCURY,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
For primary bibliographic entry see Field 05A.
W73-14442

ISOTACHOPHORESIS ON PAPER. PART II THE SEPARATION OF AG (I), TL (I), HG2 (2 PLUS) AND PB (II),
Consiglio Nazionale delle Ricerche, Rome (Italy). Laboratorio di Cromatografia.
For primary bibliographic entry see Field 05A.
W73-14449

A PHOTON COUNTING DEVICE FOR THE MEASUREMENT OF NANOSECOND AND MICROSECOND KINETICS OF LIGHT EMISSION FROM BIOLOGICAL SYSTEMS,
MSU-AEC Plant Research Lab., East Lansing, Mich.
For primary bibliographic entry see Field 05A.
W73-14453

DETERMINATION OF ALUMINIUM BY ATOMIC ABSORPTION SPECTROPHOTOMETRY AFTER CHELATION WITH OXINE AND EXTRACTION WITH METHYL ISOBUTYL KETONE,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
For primary bibliographic entry see Field 05A.
W73-14454

THE RELATIONSHIP BETWEEN SOIL STRUCTURE FACTOR AND BOTH SOLUBLE AND EXCHANGEABLE SODIUM AND CALCIUM IN THE NILE ALLUVIUM OF EGYPT,
Cairo Univ., Giza (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 02G.
W73-14474

ANALYSIS OF ORGANIC SALTS BY LASER IONIZATION MASS SPECTROMETRY: SUFONATES, SULFATES AND THIOSULFATES,
Pennsylvania State Univ., University Park. Dept. of Entomology.
For primary bibliographic entry see Field 05A.
W73-14546

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1971-NOVEMBER 30, 1972,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-14548

MINERAL AND THERMAL WATERS OF CANADA,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 02F.
W73-14607

WATER IN BIOLOGICAL SYSTEMS, VOL 3.

Consultants Bureau: New York, N.Y.; London, England. M. F. Vuks, A. I. Sidorova, editors. 1971. 82 p, Illus.
Identifiers: *Biological systems, Books, Organisms, Rats, *Water properties, Water chemistry, Biochemistry.

This book consists of selected papers presented at the continuing seminar on the structure and role of water in living organisms at the Physics Institute of Leningrad State University. The first section contains papers on the following topics: hydrophobic bonding in dilute aqueous nonelectrolyte solutions; resolution into components of the profiles of IR absorption bands; the structure of water; and coordination-number fluctuations in water. The next section includes papers on the following aspects of water in biological systems: use of graph-theory methods to describe the structure of water; self-diffusion constants of water in protein solutions and latex suspensions; state of water in molecular complexes of hexamethylene tetraamine with inorganic-salt crystal hydrates; and investigation of tissue water metabolism in white rats by IR spectrometry. The final section includes papers on the following: state of water in dispersed materials; optical constants of liquid water; and mechanism of water-structure ordering in solutions of nonpolar molecules. Numerous tables and graphs are included, and each paper ends with a list of literature cited.--Copyright 1973, Biological Abstracts, Inc.
W73-14650

2L. Estuaries

MARINE AND ESTUARINE POLLUTION,
California State Univ., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-14266

PRELIMINARY SURVEY OF MERCURY AND OTHER METALS CONTAINED IN ANIMALS FROM THE FRASER RIVER MUDELATS,
British Columbia, Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-14293

ECOLOGICAL EVALUATION OF MULTIUSE WATERS RECEIVING PRIMARY TREATMENT EFFLUENT PRIOR TO A MAJOR FLOW INCREASE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-14361

HYDRODYNAMICS OF ESTUARINE RIVER REACHES AND OFFSHORE ZONES OF NONTIDAL SEAS (GIDRODINAMIKA UST'YEVYKH UCHASTKOV REK I VZMORIY BESPRILIVNYKH MOREY),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
T. G. Voynich-Syanozhentskiy.
Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 46 (52), Leningrad, 1972. 204 p.

Descriptors: *Hydrodynamics, *Hydraulics, *Estuaries, *Rivers, *Oceans, Sea water, Saline water-freshwater interfaces, Mixing, Tides, Winds, Waves (Water), Currents (Water), Density currents, Density stratification, Slopes, Sediment discharge, Sediment transport, Bed load, Suspended load, Equations.
Identifiers: USSR, Halocline, Countercurrents.

Studies are made of hydraulics of sediment-carrying flows in channels with deformable boundaries, hydrodynamics of waves and currents in estuarine offshore zones, and hydraulics of a halocline in mouths of nontidal seas. Special attention is paid to bed-load and suspended-load transportation by rivers and to stability of density currents. (Josefson-USGS)
W73-14431

CHLORINE AND TEMPERATURE STRESS ON ESTUARINE INVERTEBRATES,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 05C.
W73-14447

ARTIFICIAL AERATION AS A SUBSTITUTE FOR WASTEWATER TREATMENT,
For primary bibliographic entry see Field 05G.
W73-14464

MONROES: A TYPE OF SO-CALLED MUD VOLCANOES IN TIDAL FLATS,
Centre de Recherches Forestiere des Laurentides, Quebec.
J-C. Dionne.
Journal of Sedimentary Petrology, Vol 43, No 3, p 848-856, September 1973. 6 fig, 1 tab, 58 ref.

Descriptors: *Sedimentary structures, Mud, *Mud flats, *Ice, Intertidal areas, Ice breakup, Rivers, Ice loads.
Identifiers: *Mud volcanoes, Monroes, *St Lawrence estuary.

Small mud mounds occur in tidal flats of the St. Lawrence Estuary, Quebec, Canada. They are observed during break-up at Montmagny, 65 km NE of Quebec City, and at a few other localities. They occur generally in groups, and occasionally in isolation in relatively soft mud, have a rounded conical shape with occasionally a nipple at the top, steep slopes (40 to 65 deg), and are 5 to 25 cm in diameter, and 5 to 20 cm high. They develop under the icefoot as a result of load pressures which expel air and possibly also water trapped under surficial soft mud layer and thin ice laminae during icefoot formation, in late fall. They characterize mud tidal flats of cold regions. (Knapp-USGS)
W73-14580

EVALUATION OF A CONCEPTUAL MODEL FOR THE TRANSVERSE SEDIMENT TRANSPORT SYSTEM OF A COASTAL BARRIER CHAIN, MIDDLE ATLANTIC BIGHT,
Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences; and Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 02J.
W73-14586

EFFECT OF FISH REMOVAL ON THE GROWTH AND CONDITION OF WHITE SHRIMP, PENAEUS SETIFEROUS (LINNAEUS), IN BRACKISH PONDS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
J. C. Parker, H. W. Holcomb, Jr., W. G. Klussman, and J. C. McNeill IV.
Available from NTIS, Springfield, Va. 22151 as COM-72-11134 Price $3.00, printed copy; $1.45 microfiche. Texas A and M University Sea Grant Program Report TAMU-SG-72-701, June 1972. 12 p, 4 fig, 1 tab, 3 ref. SG2-35213.

Descriptors: *Shrimp, *Brackish-water fish, *Brine shrimp, *Texas, Fish populations, Growth rates, Ponds, Research and development, Methodology, Ecosystems, Environmental effects, Fish, Biology, Aquatic animals, Marshes.
Identifiers: *White shrimp, Brackish ponds, Fish removal.

The effect of fish removal on growth and condition of juvenile white shrimp was studied in two brackish ponds near West Galveston Bay, Texas. After 77 days, shrimp in the pond in which the fish were removed averaged 12.3 mm longer and 4.0 g heavier than those in the pond with fish and seine samples indicated that shrimp abundance had noticeably declined in the pond with fish. It was concluded that fish not only prey on shrimp, thus reducing their numbers, but also compete with them for supplemental and natural feeds, thus depressing their growth rate. (Woodard-USGS)
W73-14587

THE CIRCULATION OF PRINCE WILLIAM SOUND,
Alaska Univ., College. Inst. of Marine Science.
R. D. Muench.
Available from NTIS, Springfield, Va. 22151 as E73-10291 Price $3.00, printed copy; $1.45 microfiche. ERTS-1 Contract project report to NASA, February 20, 1973. 10 p. NAS5-21833.

Descriptors: *Water circulation, *Gulfs, *Sounds, *Aerial photography, *Alaska, Remote sensing, Satellites (Artificial), Sediment discharge, Currents (Water), Coasts, Estuaries, Data collections, Winds, Tides, Streamflow.
Identifiers: *River sediment plumes, *Prince William Sound region (Alaska).

The feasibility was determined for studying surface circulation in coastal waters using surface visible properties observed from ERTS-1 imagery and surface water circulation in the Prince William Sound region (Alaska). Circulation patterns deduced from oceanographic data are correlated

with features seen on the ERTS imagery. Results suggest that sediment-laden plumes of freshwater from rivers may be useful tracers of surface water motion due to their high visibility. The two usable images obtained to date corroborate that westerly flow was occurring in the Gulf of Alaska just south of Prince William Sound, and that an inflow into Prince William Sound was occurring concurrently with flood tides on both occasions. River plumes are useful tracers, but poor weather conditions somewhat limit the use of satellite imagery. (Woodard-USGS)
W73-14588

HISTORY OF THE SOUTH CAROLINA OYSTER,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Center.
W. J. Keith, and R. C. Gracy.
Available from NTIS, Springfield, Va. 22151 as COM-73-10065 Price $3.00, printed copy; $1.45 microfiche. South Carolina Office of Marine Conservation, Management and Services Educational Report No 1, March 1972. 19 p, 18 fig, 15 ref.

Descriptors: *Oysters, *Estuaries, *South Carolina, History, Spawning, Growth rates, Productivity, Environmental effects, Tidal effects, Salinity, Sedimentation, Water temperature, Water quality, Water pollution effects, Industrial wastes, Sewage effluents, Commercial shellfish, Economic impact.

Within the borders of South Carolina are approximately 2,2000 miles of saltwater creeks, bays, sounds and rivers. Many of these bottoms support oyster beds. Some 7,059 acres of intertidal oyster grounds are either under private lease or included in Public Recreational Shellfish Grounds. The modern oyster industry had its beginnings in the nineteenth century. Commercial production peaked shortly after the beginning of the twentieth century. Current harvesting problems hold annual production to about 250,000 bushels. However, in terms of dollar value the oyster in South Carolina is the second most valuable seafood product. South Carolina oysters have a wide variety of shapes and sizes. This diversity of configuration depends upon the place the set occurs, subtidal or intertidal, and the growing conditions present at the place of set. The most common type of growth produces groups known as the 'cluster oyster'. These oysters grow in the intertidal zone and are formed by successive yearly sets on the older oysters. Steam canneries prefer the larger clusters which can be more economically harvested and processed. Today, the Ashley River produces no oysters commercially. The Ashley River is and has been for some years heavily polluted with sewage and mill waste. This pollution may have been the cause of the decrease in the size of the oysters of today. (Woodard-USGS)
W73-14589

ESTUARINE AND COASTAL WATER DYNAMICS CONTROLLING SEDIMENT MOVEMENT AND PLUME DEVELOPMENT IN LONG ISLAND SOUND,
Geological Survey, Hartford, Conn.
F. H. Ruggles Jr.
Available from NTIS, Springfield, Va. 22151 as E73-10378; Price $3.00, printed copy; $1.45 microfiche. Progress Report to NASA, Goddard Space Flight Center, February 28, 1973. 1 p.

Descriptors: *Mixing, *Estuaries, *Sounds, *Aerial photography, *New York, Inflow, Saline water-freshwater interfaces, Salinity, Movement, Sediment transport, Streamflow, Remote sensing, Satellites (Artificial), Hydrologic data, Salinity, Chemical stratification, Analytical techniques.
Identifiers: *Long Island Sound (NY), *Connecticut River (Conn), Inflow plumes.

As the Connecticut River flows into Long Island Sound, large plumes develop during the mixing of ocean and estuarine waters. Plumes were delineated for July 28, October 8, October 27, and December 2, 1972, by analyzing ERTS-1 imagery with the SRI Electronic Satellite Image Analysis Console (ESIAC). Because the chemical and physical composition of the plume and ocean water were not too different the ESIAC was utilized to expand the scenes and subject the transparencies to varying combinations of viewing techniques to identify and delineate the plumes. Best results were obtained when band 5 transparencies were used. Indications are, when the scene being analyzed is predominantly in the first two steps of the gray scale, it is best to use the negative transparencies. When the analysis is being done above the first two steps of the gray scale, it is best to use the positive transparencies. (Woodard-USGS)
W73-14590

FORECAST OF THE 1972 PINK SALMON RUNS, SOUTHEASTERN ALASKA,
Alaska Dept. of Fish and Game, Juneau. Div. of Commercial Fisheries.
K. E. Durley, and M. C. Seibel.
Available from NTIS, Springfield, Va. 22151 as COM-72-11432 Price $3.00, printed copy; $1.45 microfiche. Informational Leaflet No 158, July 1972. 39 p, 6 fig, 6 tab, 6 ref.

Descriptors: *Pink Salmon, *Anadromous fish, *Fish migration, *Fish harvest, *Alaska, Forecasting, Analytical techniques, Fish populations, Pacific Ocean, Estuaries, Environmental effects.
Identifiers: *Pink Salmon runs forecasting (Alaska), Fish tagging.

Results of the 1971 preemergent fry sampling indicate a return in 1972 of 13.7 million pink salmon to southern Southeastern Alaska and a return of 12.9 million to northern Southeastern Alaska for a total return of 26.6 million pinks. Although the total magnitude of the run appears relatively strong, the forecast by district and timing segments indicates that returns to certain areas will be very weak. The harvest in southern and northern Southeastern Alaska is expected to be approximately 7.7 million and 8.9 million respectively. Tagging studies have indicated that upon entering the offshore waters of Southeastern Alaska pink salmon separate into two groups, the northern group entering via Icy Strait and the lower Chatham Strait and the southern group entering via Sumner Strait and Dixon Entrance. (Woodard-USGS)
W73-14591

RESTORATION OF ALABAMA'S SUPPLY OF SEED OYSTERS,
Alabama Dept. of Conservation and Natural Resources, Montgomery.
J. H. Crance.
Available from NTIS, Springfield, Va. 22151 as COM-72-11199 Price $3.00, printed copy; $1.45 microfiche. Completion Report to NOAA, National Marine Fisheries Service, August 1969. 2 p.

Descriptors: *Oysters, *Fisheries, Fish populations, *Fish management, *Alabama, Estuaries, Ecosystems, Ecology, Aquiculture, Shellfish, Growth rates, Fish reproduction, Water pollution effects, Mortality.
Identifiers: *Oyster planting, Cedar Point reefs (Alabama).

A shell planting program was begun during 1968 in an effort to restore the supply of seed oysters at Cedar Point reefs in Alabama. A total of 143,127 barrels of shells were planted. Spat set on shells planted in the three areas during 1968 averaged 1.6 spat per shell in Area 3, 4.8 spat per shell in Area 2 and 5.8 spat per shell in Area 1, one month following planting. (Woodard-USGS)
W73-14595

OCEANOGRAPHY (OKEANOGRAFIYA).
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).

Dal,nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37. Leningrad, G. G. Chalenko, editor, 1972. 107 p

Descriptors: *Oceanography, *Pacific Ocean, *Subarctic, Sea water, Sea level, Tides, Thermal stratification, Convection, Temperature, Thermal conductivity, Water structure, Dissolved oxygen, Hydrogen ion concentration, Straits, Meteorology, Synoptic analysis, Stations, Forecasting, Measurement, Winter.
Identifiers: USSR, *Soviet Far East, Kurile Islands, Sea of Okhotsk, Heat exchange.

Dynamics and structure of waters in the subarctic zone of the Pacific Ocean were investigated in this collection of 9 papers prepared by the Far Eastern Hydrometeorological Scientific Research Institute in Vladivostok. Studies are made of dissolved oxygen and pH in Kurile Islands straits in winter and of surface-water temperatures and thermal conductivity in the Sea of Okhotsk, and methods are developed for forecasting average monthly air temperature anomalies for December-April for 25 coastal hydrometeorological stations in the Soviet Far East. (Josefson-USGS)
W73-14597

STUDENT PROJECTS ON COASTAL ZONE AND OFFSHORE RESOURCES MANAGEMENT,
Massachusetts Inst. of Tech., Cambridge.
S. Resnick, J. Nichols, R. Chertow, and R. Dwyer.
Available from the National Technical Information Service as COM-73-10262. Report No. MITSG 72-13 and Index No. 72-313-Nd1, June 30, 1972, 146 p, 1 fig, 4 tab, 11 and 8 ref. NOAA Sg 2-35150.

Descriptors: *Coasts, Water resources, *Water pollution effects, *Waste disposal, Natural resources, *Thermal pollution, Economics, Management, *Cost-benefit analysis, *Electric power industry, *Biomass, Outfalls, Massachusetts.
Identifiers: Woods Hole (Mass), Ocean outfall, Electric utilities, Narragansett Bay (R.I.), Species diversity.

Two student projects on coastal zone and offshore resources management are presented. The first, 'Environmental Cost-benefit Analysis, Regulatory Administration, and the Financial Administration of Electric Utilities', represents an effort to apply marginal techniques and a limited knowledge of technology to establish a framework of approach to a complex set of problems which our society faces today. In the second, 'Some Experiments Relating to the Woods Hole Outfall', it was concluded that the observable effects of the outfall appear to be limited to a radius of less than 10 meters about the outfall. Within this radius, there are changes in the summer and fall community, with respect to dominant species diversity and biomass. In the winter, there was almost no significant difference. (Sinha-OEIS)
W73-14615

A REVIEW OF THE CHARACTERISTICS, BEHAVIOR AND DESIGN REQUIREMENTS OF TEXAS GULF COAST TIDAL INLETS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
E. J. Schmeltz, and R. M. Sorensen.
Avialable from the National Technical Information Service as COM-73-10695. Texas A and M University, Sea Grant Program. Report No C.O.E. 156 and TAMU-SG-73-202, April 1973. 88 p, 21 fig, 4 tab, 65 ref. NOAA-04-3-158-18.

Descriptors: *Coasts, *Inlets (Waterways), Tidal waters, Hydraulics, *Design criteria, Stabiliza-

tion, Fresh water, Littoral drift, *Sediment transport, *Texas.
Identifiers: *Tidal inlets, Tidal waves, Inlet design, Artificial inlets.

Characteristics, behavior and design requirements of Texas Coast tidal inlets are reviewed. The characteristics of natural inlets are summarized under the following heading: inlet formation, shoal areas, offshore bar, spit formation and channel migration, secondary channels, sediment size distribution, regional peculiarities, and selected Texas Inlets. Tidal wave propagation is discussed. Pertinent factors influencing inlet stability and configuration, are littoral drift, wave action, current velocities in inlets, geometry, bottom shear, sediment load, and fresh water input. Inlet hydraulics, stability criteria, artificial stabilization and available design procedures are discussed. Hydraulic equations generally used to describe the flow in a tidal inlet are presented along with an explanation of the simplifying assumptions normally made. (Sinha - OEIS)
W73-14618

A NUMERICAL MODEL OF A FJORD ESTUARY. I. BASIC CONSIDERATIONS AND PROPOSED FINITE DIFFERENCE SCHEMES,
Alaska Univ., College. Inst. of Marine Science.
J. B. Matthews.
Report No. R72-15, October 1972. 71 p, 2 fig, 3 tab, 32 ref, 1 append. ONR-N00014-67-A-0317-0002.

Descriptors: *Estuaries, *Weather forecasting, Circulation, Diffusion, *Fjords, Equations, *Numerical analysis, *Mathematical models, *Alaska.
Identifiers: Coordinate systems, *Finite difference equations, Heat diffusion, Eddy diffusion, Boundary conditions.

Physical and numerical considerations necessary to construct a full oceanographic numerical model of a fjord estuary are set forth. A discussion of a coastal model is included and details of choice of grid and the handling of boundary conditions are given. Consideration of techniques used in numerical weather forecast models is included because some can be applied in coastal models. The grid arrangement, finite difference equations and suggested methods for tackling boundary considerations are given for a three dimensional model with time. It is proposed that a vertical two dimensional model be used as the starting point for a fjord model experiment. It is suggested that this model would give a good approximation of the circulation patterns while having an order of magnitude improvement on computer time over the 3D model. The 2D model should allow the importance of different parameters, such as eddy diffusion of heat and momentum, to be experimented with on a simple model for many cases before the 3D models are attempted. The review of previous modeling work indicates that physical boundaries and the manner in which they are treated are likely to be major new problems to be solved in coastal models. Also proposed is a three dimensional ten layer model and a set of finite difference equations. A simplification to a vertical-longitudinal fjord model is made and the set of equations is included. (Sinha-OEIS)
W73-14619

COPEPOD INDICATORS OF SURFACE WATER MOVEMENTS OFF THE OREGON COAST,
Oregon State Univ., Corvallis. Dept. of Oceanography.
F. A. Cross, and L. F. Small.
Limnology and Oceanography, Vol 12, No 1, p 60-72, January 1967. 6 fig, 1 tab, 25 ref.

Descriptors: *Copepods, *Bioindicators, *Upwelling, Rainfall, Runoff, River flow, Water properties, Coasts, Oregon, *Columbia River, *Currents (Water), Movement, Water circulation.
Identifiers: Davidson current, Acartia danae, Centropages mcmurrichi, Near shore processes, TSP diagrams, River plumes.

Two small copepods, Acartia danae and Centropages mcmurrichi, were used as reciprocal indicators of seasonal surface current changes off the Oregon coast in 1961 and 1962. A. danae was found inshore and offshore in winter, indicating the northward flow (with an onshore component) of the Davidson Current. C. mcmurrichi was found inshore in early summer and farther offshore by late summer, indicating a southerly flow (with an offshore component). In the spring and fall, these species occurred together inshore, indicating a transitional state. Temperature-salinity-plankton (TSP) diagrams were used to examine the relationships between distributions of the copepods and local processes affecting near-surface water properties (upwelling, rainfall and runoff, and the Columbia River plume). These diagrams emphasized that the major effect on copepod distribution was the seasonal shift of surface currents, with rainfall and runoff possibly affecting the inshore distribution of A. danae in winter. Upwelling had no apparent effect on the distribution of either species. Columbia River discharge, which flows southerly in summer, probably overwhelmed the general offshore (westerly) movement of surface currents, and hence the offshore movement of C. mcmurrichi, near the mouth of the river. The effect of the Columbia River plume farther out to sea was not shown conclusively to have an effect on the distribution of either species in summer. (Sinha-OEIS)
W73-14620

ENVIRONMENTAL EFFECTS OF HYDRAULIC DREDGING IN ESTUARIES,
Alabama Marine Resources Lab., Dauphin Island.
For primary bibliographic entry see Field 05C.
W73-14621

FLUME STUDIES OF THE TRANSPORT OF SEDIMENT IN ESTUARIAL SHOALING PROCESSES,
California Univ., Berkeley. Hydraulic Engineering Lab.
R. B. Krone.
Final Report prepared for Army Engineer District, San Franciso, June 1962. 110 p, 35 fig, 3 tab, 23 ref, 2 appen. DA-04-203 CIVENG-59-2.

Descriptors: Estuaries, *Bays, *Sediment transport, Deposition (Sediments), Coastal engineering, Sedimentation, Hydraulics, Flocculation, Viscosity, Particle size, Clay minerals, Shear strength, Flumes.
Identifiers: *San Francisco Bay, *Shoaling processes, Gravity flow, Fluid mud, Bed shear, Bed structure.

The object was to obtain qualitative knowledge of the transport and deposition processes of San Francisco Bay sediments and to relate these processes to properties of the sediment materials and to the flow of the suspending medium. Measurements of deposition and scour from flowing water were made in a hydraulic flume. Some samples required laboratory analyses, others such as measurements of sediment properties were made under bench-top conditions. Studies made were: particle size distribution, clay mineral analysis, non-crystalline components, flocculation, shear strength of flocs, settling and consolidation, viscosoty of sediment suspensions, and deposition from flowing salt water. Applications of laboratory findings to bay sediment transport encompassed study of shoaling processes. The following statements concluded the study. (1) Cohesive sediment is transported long distances in suspension as flocs. (2) Suspended sediment can be deposited only at bed shears less than a critical value; deposition occurs more rapidly at lower shears. (3) The deposition rate is sensitive to the flocculation rate. Flocculation is enhanced by the suspended sediment concentration, by the sizes and size distribution of flocs, and by internal shearing rates. (4) Sediment in the 'fluid mud' state can flow from rapid deposition areas into adjacent areas by gravity. (5) Above a given bed shear, sediment can be resuspended by bed failure or erosion, depending on bed structure. (Sinha-OEIS)
W73-14623

THE TWO-DIMENSIONAL FLOW OSCILLATIONS OF A FLUID IN A SPINDLE-SHAPED BASIN: APPLICATION TO PORT KEMBLA OUTER HARBOUR, N.S.W., AUSTRALIA,
Wollongong Univ. Coll. (Australia). Dept. of Mathamatics.
D. J. Clarke, and N. D. Thomas.
Australian Journal of Marine and Freshwater Research Vol 23, No 1, p 1-9, June 1972. 4 fig, 5 tab, 7 ref.

Descriptors: *Harbors, *Storms, *Mathematical models, *Ocean waves, Resonance, Synthetic hydrology, Flow characteristics.
Identifiers: Long waves, Progressive waves, *Australia coast (N.S.W.).

Port Kembla Outer Harbour has a history of severe ranging during storm activity, and hence a knowledge of its resonant behavior is a necessary requirement towards understanding the cause of the range action. The Harbour has been shown to be suitably approximated by a spindle shape, which is the name given by Hidaka (1931) to a basin whose surface perimeter is defined as the intersection of two confocal parabolae. Hidaka's results are enlarged; more basic harmonics being found. These are then applied to the Outer Harbour which is assumed to be excited by a fully formed clapotis with an antinode at the entrance. The two particular harmonics which are most likely to be excited are found to have the same period of 153 sec. Experimental evidence has given long wave periods in the Harbour as 150 and 160 sec. The resonant mode corresponding to a period of 54 sec is found to have a large amplification factor at the entrance to the Inner Harbour, and this may be compared with model study results where at 56-58 sec the range action is greatest. (Sinha-OEIS)
W73-14624

WAVE MEASUREMENTS OFF OXNARD, CALIFORNIA,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08B.
W73-14625

REFRACTION OF DISPERSIVE WAVES ON A BEACH,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08B.
W73-14628

TIME SENSING AND ANALYSIS OF COASTAL WATERS,
Virginia Inst. of Marine Science, Gloucester Point.
M. Nichols, and M. Kelly.
In: Remote Sensing of the Environmental, Proc of 8th International Symposium held at Willow Run Laboratories, Ann Arbor, Michigan, October 1972. p 969-981, 1972, 10 fig, 9 ref. ONR N00014-72C-0268.

Descriptors: Photography, *Sediment transport, Plankton, *Estuaries, *Remote sensing, *Satellites (Artificial), *Aerial photography, *Coasts.
Identifiers: Tonal patterns, Densitometry.

Sequential photographs from aircraft and satellites provide a source of data for studying dynamic features of coastal waters. Procedures for detecting

features follow several approaches; (1) application of sequential signatures, (2) inferences from hydraulic flow patterns, (3) simple comparative analysis. To quantitatively detect tonal changes, images in two or more frames must have proper registration and comparable tones, i.e. tones free of photographic difference and changes of solar illumination. Tonal difference is removed by normalizing successive time frames. Control points with stable reflectance are selected, their densities are measured in successive frames, differences determined and the resulting linear correction is applied to the density distribution of transient tonal areas of water. Once tones are brought to a common density reference, differences of image density in the same geographic area are determined between frames taken from time to time, areas of equal change are delineated and further related to causal processes or impacts. Normalizing and numerical differencing is best accomplished by employing a digital or computerized microdensitometer and by analyzing one spectral band at a time. Application of the procedures is demonstrated by analyses of tonal patterns representing suspended sediment and plankton in an estuary. (Sinha-OEIS)
W73-14631

RIP CURRENTS. 2. LABORATORY AND FIELD OBSERVATIONS,
Liverpool Univ. (England). Tidal Inst.
For primary bibliographic entry see Field 02E.
W73-14636

TURBIDITY, TRANSPARENCY AND COLOR OF WATER IN THE ESTUARY AREA (MUTNOST', PROZRACHNOST' I TSVET VOD VZMOR'YA),
I. A. Ray, and K. Bondar.
Available from the National Technical Information Service as AD-651-798 , $3.00 in paper copy, $1.45 in microfiche. Naval Oceanographic Office, Washington, D.C. Report No Trans-258, 1967. Trans. from Gidrologiya ust'yevoy Oblasti Dunaya, Chapter 12, p. 326-332, 1963. 13 p, 7 fig, 2 tab.

Descriptors: *Estuaries, *Deltas, Coasts, Shallow water, Optical properties, Wind, Rivers, Sedimentation, *Turbidity, Storms, *Color.
Identifiers: *Danube River, *Transparency, Wind-driven currents, USSR, Romania.

On the basis of observations conducted by various organization of USSR and Rumania the distribution of turbidity, transparency and color of water in the Danube estuary area was determined. It appears that the degree of turbidity depends upon the nearness to the distributaries of the Danube delta, the force and direction of wind, the quantity of discharged water per unit time and the velocity and mass of fluvial currents. The greatest degree of turbidity is observed during the flood period in the Danube (maximum in June). In the coastal portion of the estuary the variation of turbidity is determined not so much by the discharge of the river as by the action of wind-driven currents. Therefore the maximum values of turbidity in shallow areas are observed during strong storms. The numerical values of transparency dependent upon these factors are briefly summarized, compared and charted, so as to present the spatial pattern of the distribution of transparency and color of water, as well as their variations with time and climatic conditions. (Sinha-OEIS)
W73-14637

A CASE STUDY OF LITTORAL DRIFT BASED ON LONG-TERM PATTERNS OF EROSION AND DEPOSITION,
Johns Hopkins Univ., Baltimore, Md. Cheaspeake Bay Inst.
J. R. Schubel, H. H. Carter, E. W. Schiemer, and R. C. Whaley.
Chesapeake Science Vol 13, No 2, p 80-86, June 1972. 8 fig, 3 ref NOAA PL 89-304, Proj AFC-4-1

Descriptors: *Littoral drift, *Coasts, *Sediment transport, Erosion, Sedimentation, Sands, *Estuaries, *Deposition (Sediments), *Chesapeake Bay
Identifiers: Near shore processes, Longshore drift, Sand transport.

A knowledge of the routes and rates of littoral drift is a prerequisite to predicting the probable effects of proposed nearshore structures on the maintenance of a stretch of coast. The prevailing patterns of littoral drift can, at least in some cases, be more reliably established by inference from the long-term patterns of erosion and deposition than through short-term field studies of sediment transport. For an 8-mile stretch of Chesapeake Bay coast, a case study was designed to delimit the long-term patterns of erosion and accretion in order to establish the prevailing littoral drift. The routes of nearshore sediment transport inferred from the sediment budget data indicate that there is a prevailing longshore drift from north of Long Beach to just south of the cape at Flag Ponds where an eddy interrupts the sand movement. The longshore transport is reestablished south of the Flag Ponds and extends to Cove Point. (Sinha - OEIS)
W73-14641

WAVE AGITATION IN BAYS AND HARBORS - METHODS OF MEASUREMENT AND ANALYSIS,
Tokai Univ., Tokyo (Japan). Coll. of Marine Science and Technology.
T. Sakou.
In: Proceedings Tenth Conference on Coastal Engineering, TOKYO, September 1966. Chapter 45, Vol 2, p 97-107, 1966. 5 fig, 9 ref.

Descriptors: *Bays, *Harbors, Coastal engineering, Surges, Coasts, *Waves (Water), Hawaii.
Identifiers: Honolulu, *Wave action, *Near shore processes.

Practical and effective methods for the measurement of and the determination of the type and the mode of wave action in a semi-enclosed basin are investigated. Pressure gages and flow meters are considered as instruments abailable for such measurement. The combination and arrangement of these instruments as well as the use of power spectral and cross spectral analyses as the basic means of data reduction are discussed. Special attention is given to the problem of estimating the contributions from the progressive and from the standing modes of oscillation separately. Significance of such estimation on engineering planning is briefly discussed and examples are given. (Sinha - OEIS)
W73-14643

SHALLOW-WATER WAVES,
Shell Development Co, Houston, Tex. Exploration and Production Research Div.
J. E. Chappelear.
Journal of Geophysical Research Vol 67, No 12, p 4693-4704, November 1962. 4 fig, 1 tab, 11 ref.

Descriptors: *Shallow water, Ocean waves, *Waves (Water), *Coasts.
Identifiers: *Solitary waves, Wave properties.

The physical problem is to calculate the profile and velocity components of a wave, subject to the conditions that the effects of viscosity and surface tension can be neglected. The flow is required to be steady, irrotational, and two dimensional, and the depth of the water is assumed to be small and constant. The shallow-water approximation, first proposed by Friedrichs, is employed, and two additional orders of approximation, beyond the three calculated by Keller, are obtained. The formulas describing the solitary wave are obtained as a special case, and the velocity of the solitary wave so obtained is found to agree almost exactly with the Boussinesq-Rayleigh formula c = the square root of gd (1 + H/d), where c is the wave velocity d is the depth, and H is the wave height. This velocity differs by no more than 2 per cent from the experimental values of Stephan and Dailey. (Sinha - OEIS)
W73-14644

SALT-WATER INTRUSION IN PRINCE EDWARD ISLAND,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch
P. A. Carr.
Canadian Journal of Earth Sciences Vol 6, No 1, p 63-74, February 1969. 9 fig, 3 tab, 15 ref.

Descriptors: *Estuaries, *Tides, *Saline water intrusion, Aquifers, Density, *Canada diffusion.
Identifiers: *Prince Edward Island.

The numerous saline estuaries situated throughout Prince Edward Island permit high tides to carry salt water a long way inland and to penetrate the bedrock aquifer. Very little groundwater consumption occurs around the banks of the Eliot River estuary, yet salt water has moved into the bedrock to a depth of 185 ft. Beneath this salty water is fresh groundwater, which extends down to about 600 ft where it is underlain by salty water. The salty water in the upper 185 ft of the aquifer is not separated from the fresh groundwater by a confining stratum, but is kept in this position by the higher head of the fresh groundwater. This head maintains a dynamic equilibrium with the heavier salty water. The effect of density in maintaining the position of a fresh and salt water front is not as important as has been previously thought. (Sinha - OEIS)
W73-14645

LATERAL DIFFUSION IN A TIDAL ESTUARY,
Baghdad Univ. (Iraq). Coll. of Engineering.
A. M. Alsaffar.
Journal of Geophysical Research, Vol 71, No 24, p 5837-5841, December 15, 1966. 4 fig, 1 tab, 9 ref.

Descriptors: *Estuaries, Turbulence, Diffusion, Mixing, Waste disposal, Tidal effects, *Energy dissipation, *California, Coasts, Tides, Path of pollutants.
Identifiers: San Francisco Bay, Lateral diffusion, *Tidal estuaries, *San Joaquin River estuary.

Experimental data on the lateral diffusion in a tidal estuary of the San Joaquin River, near San Francisco Bay, were obtained and analyzed. The data were obtained by photographing floating particles. Richardson's 'four-thirds law' is verified by using the neighbor distribution hypothesis. The diffusion coefficient is a function of the mean separation distance and the velocity of flow. The mean separation distance and the variable diffusion coefficient are particularly discussed in relation to the rate of energy dissipation. (Sinha - OEIS)
W73-14647

SIZE DISTRIBUTIONS OF MINERAL GRAINS SUSPENDED IN CHESAPEAKE BAY AND NEARBY COASTAL WATERS,
Woods Hole Oceanographic Institution, Mass.
G. C. Bond, and R. H. Meade.
Chesapeake Science Vol 7, No 4, p 208-212, December 1966. 1 fig, 9 ref.

Descriptors: Sediments, *Particle size, *Bays, *Deposition (Sediments), *Coasts, *Estuaries, Suspended load, *Sediment transport, *Chesapeake Bay, Litteral.
Identifiers: Cape Henry, Cape Hatteras, Suspended matter, Mineral grains.

Recognizable mineral grains constituted 2 to 15% of the suspended matter in surface waters col-

ected in June 1965 from Chesapeake Bay and rom the offshore area between Cape Henry and 'ape Hatteras. In the upper bay, the mineral grain ize became progressively finer in the down-bay irection. Mineral size distributions in the middle nd lower bay showed little relation to those in ither the upper bay or the offshore waters. Most f the mineral grains suspended in the offshore vaters (considered on a weight basis) seemed to be erived from sources other than the bay effluent. Sinha - OEIS)
V73-14654

EDIMENTS OF THE JAMES RIVER ESTUA-Y, VIRGINIA,
'irginia Inst. of Marine Science, Gloucester Point.
I. M. Nichols.
Geological Society of America Memoir 133, p 169-12, 1972. 28 fig, 1 tab, 36 ref.

Descriptors: *Estuaries, *Sediment transport, Bottom sediments, Organic matter, *Deposition Sediments), Sedimentation, *Bathymetry, Partile size, Salinity, *Virginia.
Identifiers: *James River Estuary (Va), Tidal currents, Sea level variations.

The James River estuary of the Chesapeake Bay egion follows the course of a former river valley rowned within the last 9,000 years by the most ecent rise of sea level. The floor is shaped into a entral channel bordered by submerged shoals. Observations show suspended sediment is transported mainly by alternating tidal currents and econdarily by the net nontidal estuarine circulaion. Transport results in a sequence of grain size istributions reflecting the mixing of two textural nd members, clay and sand. Silty clay is eposited in the river and upper estuary, whereas and occurs near the mouth. Transitional types, layey sand and sand-silt-clay, predominate in the niddle estuary. Additionally, biogenic materials, yster shells and fecal pellets, and small amounts f residual components eroded from older leposits are mixed into the sediments by currents, vaves, and organisms. Bottom sediment types ary widely according to local relief, to varying inensity of environmental processes, and to changng rates of supply from different sources. Deposiion is greatest in the middle estuary where salinity anges from 5 to 14 parts per thousand. An elongate zone of relatively high deposition in the lower stuary corresponds to the intersection of the level f no-net-motion with the bottom. Despite subtantial infilling, it is believed the estuary is mainained by the continued rise of sea level and by urrents that flush part of the river-borne load hrough the estuary. (Sinha - OEIS)
W73-14656

OCEANOGRAPHIC SURVEYS OF TRAITORS COVE REVILLAGIGEDO ISLAND, ALASKA,
Bureau of Commercial Fisheries, Washington, D.C.
D. R. McLain.
Special Scientific Report - Fisheries No 576, December 1968. 17 p, 15 fig, 2 tab, 12 ref.

Descriptors: *Estuaries, *Turbulence, *Stratification, *Coasts, *Circulation, Water properties, *Fiords, Estuarine environments, Salinity, Dissolved oxygen, Tidal effects, *Alaska.
Identifiers: *Tidal falls, Reversing tidal falls.

Traitors Cove is a small fiordlike estuary in southeastern Alaska. It is divided into two basins by a narrow constriction, where a reversing tidal falls forms. Four oceanographic surveys of the estuary between 1963 and 1965 showed that this tidal falls creates a region of strong turbulence and destroys the stratification of the water near it. Surface currents in the estuary are predominantly seaward on ebb tide and toward the head of the estuary on flood tide. (Sinha - OEIS)
W73-14657

CIRCULATION, SALINITY AND RIVER DISCHARGE IN THE MERSEY ESTUARY,
Liverpool Univ. (England). Dept. of Oceanography.
K. F. Bowden, and S. H. Sharaf El Din.
Geophysical Journal. Royal Astronomical Society, Vol 10, No 4, p 383-399, Jan. 1966. 7 fig, 8 tab, 6 ref.

Descriptors: *Estuaries, *Mixing, *Salinity, River flow, *Circulation, Tides, Diffusion.
Identifiers: *Mersey Estuary (U.K.), Vertical eddy diffusion, *River discharge.

Observations of currents and salinity in the Narrows of the Mersey estuary have been analyzed in terms of the mixing processes and the dynamics of the flow. At each of 3 stations in a section across the estuary there was a downstream flow in the upper layer and an upstream flow near the bottom, relative to the depth-mean current. Computed values of the coefficient of vertical eddy diffusion, Kz, reached a maximum of 28 sq cm/s at mid-depth at the central station. From observations of salinity in 2 sections at opposite ends of the Narrows, repeated at approximately monthly intervals throughout a year, a high correlation was found between the properties of the salinity distribution and the river discharge into the estuary. While the salinity at the 2 sections decreased with increasing discharge, the horizontal and vertical gradients of salinity both increased. The probable change in the circulation, associated with these salinity changes, is discussed. Variations in the tidal range had a comparatively small effect on the salinity distribution. (Sinha - OEIS)
W73-14658

SALINITY VARIATIONS IN THE CONNECTICUT RIVER,
Geological Survey, Woods Hole, Mass.
R. H. Meade.
Water Resources Research Vol 2, No 3, p 567-579, 1966. 12 fig, 7 ref.

Descriptors: *Estuaries, *Salinity, *Tides, Winds, Rivers, Fresh water, Salt water, *Connecticut river, Mixing, Winds, Chlorides.
Identifiers: *Salt-wedges, River discharge, *Tidal flushing.

Salinity distributions in the lower Connecticut River, measured during the years 1934 through 1939, show the influence of at least three factors: river discharge, tide, and wind. Salinity near the mouth is rather sensitive to changes in upland discharge; discharge events recorded at a gage 101 km upstream are followed a day or two later by markedly equivalent changes in salinity at the mouth. During average or greater-than-average discharge conditions the lower river has the characteristics of a 'salt-wedge' estuary: the water on the bottom of the river may contain 15 parts of chloride per thousand at high tide, whereas the water in the same section of the river at low tide may be almost completely fresh. The effects of winds on salinity are uncertain, but such effects can be either local or related to regional effects of winds on the tides at the river mouth. (Sinha - OEIS)
W73-14659

REFRACTION OF WATER WAVES,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
J. A. Battjes.
Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol 94, No WW4, Proceedings paper 6206, p 437-451, November 1968. 3 fig, 15 ref, append.

Descriptors: *Refraction (Water waves), Hydrodynamics, *Ocean waves, *Gravity waves, *Waves (Water), Coasts.
Identifiers: *Gravity surface waves, Wave amplitudes, Wave propagation, Shoaling, Diffraction.

An investigation is presented of the propagation of 3-dimensional, harmonic waves of small amplitude through water of constant depth or gradually varying depth. Within the framework of linear theory for potential flow, the results are exact for propagation over horizontal bottoms, e.g., diffraction, and approximate for propagation over sloping bottoms, e.g., refraction combined with diffraction. An expression is given for the velocity potential of 3-dimensional waves, harmonic in time. The velocity potential must fulfill the classical hydrodynamical conditions. An analysis of the resulting relationships shows that the magnitudes of phase speed and energy flux are affected by amplitude variations. The time-averaged energy flux is directed along wave rays, regardless of amplitude gradients along the wave crests. The expressions for phase speed and energy flux do not involve wave rays; they provide the basis of a computational scheme in which the wave characteristics are com puted in grid points which have a predetermined location. The method may be an alternative for existing methods which utilize wave rays. (Sinha - OEIS)
W73-14660

SOME ASPECTS OF THE OCEANOGRAPHY OF LITTLE PORT WALTER ESTUARY, BARANOF ISLAND, ALASKA,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. F. Powers.
Fishery Bulletin, (U. S. Fish and Wildlife Service), Vol 63, No 1, p 143-164, 1963. 27 fig, 3 tab, 10 ref.

Descriptors: *Estuaries, Fish management, Salmon, *Circulation, *Salinity, *Temperature, Optical properties, Estuarine environment, Dissolved oxygen, Estuarine fisheries, *Alaska, *Oceanography.
Identifiers: Flushing, *Little Port Walter (Alas), Oncorhynchus gorbuscha.

Oceanographic studies made in the spring and summer of 1959 in the estuary of Little Port Walter, Alaska are reported. These were made as part of a series of investigations on the biology of pink salmon, Oncorhynchus gorbuscha. Information is given on the distribution of salinity, temperature, transparency, and dissolved oxygen; circulation and flushing of the estuary and the relation of these factors to the discharge of Sashin Creek; and total water transport into and out of the estuary. The methods of studying these processes and parameters are explained. A bathymetric chart of the estuary and meteorological data are included. (Sinha-OEIS)
W73-14665

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

APPLICATION OF FLUIDIZED BED FOR CONTROLLING THE CONCENTRATION POLARIZATION BOUNDARY LAYER IN REVERSE OSMOSIS DESALINATION SYSTEMS,
National Instrument Labs., Inc., Fredericksburg, Va.
H. Lolachi.
Available from the National Technical Information Service as PB-219 136, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No 843, March 1973. 57 p, 8 tab, 22 fig, 8 ref. OSW Contract 14-30-2909.

Descriptors: *Desalination, *Reverse osmosis, *Boundary layers, *Permeability, Reynolds number, Cellulose, *Membranes.
Identifiers: Salt rejection, Fluidized bed, Glass microbeads, Surface fouling, Water flux, Tubular reverse osmosis, *Polarization, Cellulose acetate.

The following results have been achieved towards concentration polarization and fouling reduction control. Fluidized beds were compatible with reverse osmosis membranes and did not damage the active membrane surface. Application of a fluidized bed diminishes the concentration polarization to such extent that at low Reynolds number, i.e. 50 to 250, potable water better in quality than some systems operating with turbulent flow was obtained. High water receoveries were obtained, for example, from a 5 ft. long tube with 3/4 in. outer diameter, 30 to 50 per cent product water recoveries were obtained at pressures ranging between 600 to 1500 psi. (OSW)
W73-14377

THE EFFECTS OF POROUS AND SOLID FILLERS ON THE PERMEABILITY OF CELLULOSE ACETATE MEMBRANES,
Cornell Univ., Ithaca, N.Y. School of Chemical Engineering.
P. Harriott, J. Wu, and F. Klunker.
Available from the National Technical Information Service as PB-221 315, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 846, April 1973. 28 p, 21 fig, 2 tab, 15 ref. OSW Contract 14-01-0001-2155.

Descriptors: *Desalination, *Reverse osmosis, Cellulose, Silica, Gels, Sands, *Thermal conductivity, *Membranes, Porous media, Permeability, Diffusivity, Moisture content.
Identifiers: Salt permeability, Salt diffusivity, Compaction resistance, *Fillers, Water flux, Distribution coefficients, Cellulose acetate.

Several types of filled cellulose acetate membranes were prepared to determine the effect of filler properties and polymer properties on permeability of the composite materials. Casting procedures were chosen to give a dense cellulose acetate phase and a uniform distribution of filler throughout the membrane. The composite membranes were evaluated in a reverse osmosis cell and in extraction or desorption tests at ambient conditions. Salt and water permeabilities were measured on filled and unfilled membranes of varying acetyl content. (OSW)
W73-14378

PREPARATION OF HOLLOW FIBERS AND THE EVALUATION OF THEIR PROPERTIES,
Akron Univ., Ohio. Inst. of Polymer Science.
E. A. Meinecke, D. V. Mehta, and S. Crume.
Available from the National Technical Information Service as PB-219 395, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 845, March 1973. 213 p, 102 fig, 14 tab, 63 ref. OSW Contract 14-01-0001-1456.

Descriptors: *Desalination, Membranes, Cellulose, *Membrane processes, *Permeability, Mechanical properties, Creep, Stress.
Identifiers: *Hollow fibers, Salt rejection, Water flux, Fiber failure mechanisms, Cellulose acetate, Melt extruder, Birefringence.

A small melt extruder was designed and constructed for the production of low flux hollow fibers from Eastern E-400-25 cellulose acetate. The screw driven extruder, equipped with special stretching and take up mechanisms, was used to produce fibers having diameters ranging from .003 to .05 inches, with a variable wall thickness to diameter ratio. Hollow fiber bundles were prepared by casting fiber ends in epoxy blocks for insertion into high pressure test cells. Hollow fibers were also produced by solution extrusion. However, solvent evaporation difficulties limited the wall thickness/diameter ratio to values too small to withstand the high pressures encountered in reverse osmosis processes. Desalination characteristics of unstretched and stretched membranes were studied as a function of membrane thickness. Fick's law of transport was applicable not only to the flux characteristics of unstretched membranes, as expected, but also to those of stretched membranes. The applicability of time-temperature superposition to the ultimate elongation of cellulose acetate was also established in these studies. Model studies were also made to determine the influence of fiber geometry to the various mechanisms of fiber failure. (OSW)
W73-14379

GUIDE TO OPERATION AND MAINTENANCE OF THE AUTOMATIC PARTICLE SIZE ANALYZER,
Rocketdyne, Canoga Park, Calif.
G. R. Schneider.
Available from the National Technical Information Service as PB-220 228, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 839, March 1973. 43 p, 9 fig, 1 append, 5 tab. OSW Contract 14-30-3000.

Descriptors: Particle size, Ice, Desalination, Freezing, Automation, Instrumentation.
Identifiers: *Particle size analyzer.

An Automatic Particle Size Analyzer (APSA) for analyzing the particle size distribution in a freeze crystallizer is described. The system contains the following electronic and optical instruments: (1) a particle sensor, (2) an amplifier/power supply, (3) a pulse converter, (4) a pulse height analyzer, and (5) a serial printer. The operation, maintenance, and data reduction from use of the APSA are described. (OSW)
W73-14380

REACTIONS AND TRANSPORT PHENOMENA AT SURFACES,
Oak Ridge National Lab., Tenn.
F. A. Posey, E. G. Bohlmann, S. S. Misra, D. V. Subrahmanyam, and F. Nelson.
Available from National Technical Information Service as PB-220 644, $1.45 microfiche. Office of Saline Water Research and Development Progress Report No. 852, May 1973. 70 p, 30 fig, 54 ref, 4 tab. OSW contract 14-01-0001-937.

Descriptors: *Titanium, *Corrosion, *Pitting (Corrosion), Saline water, *Desalination, Electrodes, Reactions, Kinetics, *Surfaces.
Identifiers: Crevice Corrosion, Porous Electrodes, Tubular Electrodes, Valve Metals, Chronopotentiometry, Silver-Silver Chloride System.

A number of topics describe various reactions and transport phenomena at surfaces which are of potential interest in desalination processes. These topics are: kinetics of pitting attack of Titanium in Chloride Solutions; pitting of Titanium Alloys in Saline Waters; kinetics of Initiation of Crevice Corrosion of Titanium; effect of Flow Rate on Efficiency of Oxidation-Reduction Reactions in Porous and Tubular Electrodes; rectifying Properties of Valve Metals in a One-Compartment Electrolysis Cell; chronopotentiometry of the Ag-AgCl System and Analysis for the Chloride Ion; and influence of Inert Electrolytes on Chronopotentiometric Constants. (OSW).
W73-14381

RESEARCH AND DEVELOPMENT OF COMPOSITE MEMBRANE TECHNOLOGY,
Gulf Environmental Systems Co., San Diego, Calif.
R. L. Riley, C. E. Milstead, W. J. Wrasidlo, R. L. Grabowsky, and G. R. Hightower.
Available from the National Technical Information Service as PB-220 218, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 851, May 1973. 188 p, 32 fig, 57 tab. OSW contract 14-30-3016.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, Semipermeable membranes, Permselective Membranes, *Permeability, Thin films, Sea water, Saline water, Salinity, Ocean water, Potable water, Polymers
Identifiers: *Composite membranes, Ultra-thin films, Barrier materials, Polyelectrolyte membrane systems, Ultrafiltration membranes, Block polymers, Thin-film composites

Recent advances in the continuing development of the composite membrane have made it possible to produce potable water from seawater in a single stage system at water recoveries in excess of 50%. Stable long-term water fluxes of 25 gal/ft2 day and sodium chloride rejections of greater than 99.5% have been attained with seawater at an applied pressure of 1500 psi, water fluxes at 15 gal/ft2-day have been attained at 1000 psi applied pressure with greater than 99% sodium chloride rejection. Large-scale continuous production of composite membrane has been attained on the prototype casting machine. This achievement, combined with the excellent seawater performance of composite spiral-wound modules, demonstrates a significant advance toward the practical application of the thin film composite membrane. Block copolymers and terpolymers of completely and permanently charged cationic and anionic sequences containing various block combinations have been prepared by block polymerization of 2-vinyl-pyridine (2VP), trimethylsilylemethacrylate (TSM) and styrene (St) monomers, followed by complete quaternization of 2VP sequences, complete hydrolysis of the TSM sequence, and dehydrohalogenation. Desalination studies of dynamically formed membranes of these block copolymers are reported. The results obtained using matrix polymerization as a preparative method have shown that polyelectrolyte complex membranes are effective in the separation of low molecular weight polymeric substrates in ultrafiltration. (OSW).
W73-14382

HYPERFILTRATION IN POLYELECTROLYTE MEMBRANES,
Weizmann Inst. of Science, Rehovot (Israel).
D. Vofsi, and O. Keden.
Available from the National Technical Information Service as PB-220 221 $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 850, May 1973. 158 p, 18 fig, 15 tab. OSW contract 14-01-0001-961.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, Osmosis, *Permeability, Semipermeable membranes, Separation techniques, Permselective membranes, Thin films
Identifiers: *Hyperfiltration, Streaming potential, Charged membranes, Mosaic membranes, *Polyelectrolyte membranes, Irradiation grafted charged membranes.

Various topics dealing with fundamental aspects of transport through reverse osmosis membranes are included in two sections. I. Hyperfiltration in polyelectrolyte membranes: analysis of the hyperfiltration streaming potential; hyperfiltration by charged membranes; II. Streaming potential measurements; characterization of charged membranes during hyperfiltration; permeability mosaic membranes; hyperfiltration by dynamically formed polyelectrolyte membranes on partially cured cellulose acetate; and preparation and reverse osmosis performance of irradiation grafted charged membranes. II. The state and transport of water in membranes: the state of water in membranes; and the hyperfiltration streaming potential as a probe of water structure in membranes. (OSW)
W73-14383

RESEARCH AND DEVELOPMENT OF NEW AND IMPROVED CELLULOSE ESTER MEMBRANES,
Envirogenics Systems El Monte, Calif.
D. L. Hoernschemeyer, C. W. Saltonstall, O. S. Schaeffler, and A. J. Secchi.

vailable from the National Technical Informa-
on Service as PB-220 435, $1.45 in microfiche.
ffice of Saline Water Research and Development
rogress Report No 849, May 1973. 52 p, 12 fig, 18
b. OSW contract 14-01-0001-2205.

escriptors: *Reverse Osmosis, *Membranes,
Desalination, Permselective membranes,
Semipermeable membranes, Separation
chniques, Brackish water, Membrane processes,
ermeability, Osmosis.
lentifiers: Cellulose acetate blend, Cellulose
etate methacrylate, Membrane voids, Crosslink-
g, Swelling agents, Annealing temperature.

odified cellulose acetate blend membranes gave
initial flux of 35 gfd with 97% salt rejection,
ith a flux-decline parameter of 0.05, at 300 psi
ith 1% sodium sulfate feed. However, these
odified blend membranes contained small voids,
hich were found to rupture at pressures of 800
si or larger. Crosslinked Cellulose acetate
ethacrylate (CAM) membranes gave an initial
ux of 43 gfd and a salt rejection of 98.8% at 300
si with 1% sodium sulfate feed. A comprehensive
rogram to eliminate voids from CAM membranes
hus increasing their reliability at higher pressure)
y a solubility parameter approach to selecting a
olvent or nonsolvent different than acetone,
oprophy alcohol and water was unsuccessful.
lowever, the addition of magnesium perchlorate
o the casting solutions eliminated voids, and im-
roved the crosslinkability of CAM membranes.
he extent of crosslinking was still insufficient to
rovide a flux stability superior to that of blend
embranes at 1500 psi. (OSW).
/73-14384

ONCEPTUAL DESIGN AND COST ESTIMATE .5 MGD DIRECT CONTACT CONDENSATION IULTISTAGE FLASH DESALINATION LANT,
. E. Marwede, P. J. Schroeder, Al Kohl, and T. Shimazaki.
vailable from the National Technical Informa-
on Service as PB-220 643, $5.45 in paper copy, 1.45 in microfiche. Office of Saline Water esearch and Development Progress Report No. 21, January 1973, 78 p, 18 fig, 12 ref. OSW con-act 14-01-001-1286.

escriptors: *Design, *Cost analysis, *Condensa-
ion, Resins, Plastics, *Heat exchanges, *Distilla-
ion, *Desalination.

he conceptual design and costs of a 2.5 MGD irect Contact Condensation Multistage Flash esalination Plant (DCC-MSF) were determined. he study indicated that the process is competitive vith other processes such as VTE upflow or VTE lownflow plants. Product water was estimated to ost $0.86 per 1000 gallons. Further testing of plant omponents is recommended. (OSW)
/73-14385

ESEARCH ON IMPROVED REVERSE OSMO-SIS MEMBRANES,
Gulf Environmental Systems Co., San Diego, Calif.
C. E. Milstead, G. R. Hightower, C. R. Lyons, K. . Mysels, and R. L. Riley.
vailable from the National Technical Informa-
ion Service as PB-220 219, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 847, April 1973. 119 p, 21 fig, 8 tab. OSW contract 14-30-2609.

Descriptors: *Reverse Osmosis, *Membranes, Semipermeable membranes, *Desalination, Separation techniques, Saline water, Membrane processes, Permselective membranes.
Identifiers: *Composite membranes, *Ultrathin membranes, Spiral wound module, Compaction, Wet-dry stability, Polyacrylic polysulfone membranes.

Four principal areas of research and development were investigated. The primary effort was directed toward an investigation of the cause of aging of the cellulose nitrate-cellulose acetate (CN-CA) support and possible solutions for the effect of this aging on the physical and transport properties of the thin-film composite membrane. The second area of investigation involved the development of the composite membrane spiral-wound module. The wet-dry stability of the composite membrane modules was studied in an effort to develop a module capable of undergoing repeated wet and dry cycles without a loss in water flux or an increase in salt permeability. Cross-linking of the porous support prior to application of the thin film was also examined in an effort to reduce the flux decline after pressurization and subsequent drying at elevated temperatures. The third area of research dealt with the long-term behavior of asymmetric CA membranes, including a rheological analysis of the effect of annealing and compaction on water transport and an evaluation of the effect of pressure acting to compress the intermediate layers of the membrane. The fourth area of research consisted of further characterization of composite polyacrylic acid-polysulfone (PAA-PS) membrane performance in mixed salt systems, as well as with various inorganic and organic solutes. (OSW)
W73-14386

HUMIDIFICATION-DEHUMIDIFICATION PROCESS (SOLAR DISTILLATION),
Yugoslav Academy of Sciences and Arts, Dubrovnik. Inst. for Marine Corrosion and Desalination.
H. Ivekovic, S. Lendic, and S. Lasic.
Available from National Technical Information Service as PB-219 256, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 841, March 1973. 28 p, 16 tab, 7 fig. OSW contract 14-01-0001-1427.

Descriptors: *Desalination, Solar stills, *Solar distillation, *Distillation, *Evaporators, Humidity, Saline water.
Identifiers: *Dehumidification.

An evaporator was constructed in which warm saline water flowed downward in the capillaries of hydrophilic gauze sheets. Countercurrent to the saline water flow, warm air flowed along the evaporator through spaces between the gauze sheets thereby saturating it with water vapor. The influence of the flow rate and temperature of both the saline water and air on the amount of water obtained was studied. Eighty experiments were carried out. The highest production of distilled water was obtained with a warm saline water flow rate of 11.7 l/h and a temperature of 75C, when combined with air flow rate of 16 m3/h at 110C. (OSW)
W73-14388

3B. Water Yield Improvement

EFFICIENCY OF WATER USE AS INFLUENCED BY MICROMETEOROLOGICAL AND PHYSIOLOGICAL PROCESSES,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02D.
W73-14206

ANTITRANSPIRANTS: A POSSIBLE ALTERNATIVE TO THE ERADICATION OF SALTCEDAR THICKETS,
Arizona Univ., Tucson. Dept. of Watershed Management.
R. S. Cunningham, and D. B. Thorud.
In: Proceedings, 16th Annual Water Conference, Las Cruces, New Mexico Water Resources Research Institute, March 25-26, 1971. p 101-109, 2 fig, 1 tab, 14 ref. OWRR A-018-ARIZ (4). 14-31-0001-3203.

Descriptors: *Phreatophytes, *Transpiration control, Soil-water-plant relationships, Water conservation.

Controversy concerning the eradication of saltcedar for water salvage and flood control indicates that a management alternative may be desirable. The application of antitranspirants to saltcedar may provide such an alternative. The antitranspirants 8-HQS (0.01M) and MDSA (350 ppm) were sprayed on the foliage of potted saltcedar in a greenhouse at Tucson. The transpiration rates were 29 to 47% below control for 5 to 13 days after single applications, and following a retreatment, 27 to 35% less than control for an additonal 15 to 31 days. Consequently, plants receiving two treatments transpired less than control for a minimum of three weeks. These are considered important treatment effects. Conceivably, rainfall could diminish treatment effectiveness. Simulated rain was sprayed on plants in the greenhouse on the first, second or fourth day after treatment with antitranspirants. These studies were inconclusive. Generally, rain did not change the magnitude of transpiration reduction following treatment with antitranspirants. Likewise, rain did not cause important changes in the duration of transpiration reduction in two tests. In another test, however, plants receiving rain transpired less than control for three days, while plants receiving no rain transpired less than control for 15 to 31 days. A rain-no rain difference of this magnitude could be important in an operational treatment program. The growth, color and form of plants treated with one and two applications of 8-HQS and MDSA were not noticeably different from control during or after the experiments. (See also W73-14224)
W73-14226

ECOLOGICAL RESPONSE OF THE AUSTRALIAN NATIVE SPECIES ACACIA HARPOPHYLLA AND A TRIPLEX NUMMULARIA TO SOIL SALINITY: EFFECTS ON WATER CONTENT, LEAF AREA, AND TRANSPIRATION RATE,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Cunningham Lab.
For primary bibliographic entry see Field 03C.
W73-14472

EFFECT OF SODIUM CHLORIDE SALINITY ON THE WATER BALANCE OF ATRIPLEX HALIMUS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 03C.
W73-14477

SNOW AMOUNT IN RELATION TO STREAMFLOW AND HERBAGE PRODUCTION IN WESTERN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
E. C. Frank.
Journal of Range Management, Vol 26, No 1, p 32-34. Jan. 1973. 3 fig, 1 tab, 3 ref.

Descriptors: *Snowpacks, *Streamflow, *Vegetation effects, *Productivity, *Cloud seeding, Grasses, Grazing, *Colorado, Precipitation (Atmospheric), Snow cover, Runoff, Snow surveys.
Identifiers: Black Mesa Experimental Range (Colo).

Black Mesa Experimental Range, located west of Gunnison, Colorado, was used to determine the influence of augmenting the mountain snowpack by cloud seeding. Data were analyzed statistically to define quantitatively the relationship of peak snowpack to hydrologic characteristics and herbage production. Results indicated that increasing the snow precipitation input by 10 percent would lengthen the duration of snow cover less than 2 days; therefore it would have little, if any, im-

mediate effect on the productivity and use of grasslands. (BahrenArizona)
W73-14479

HIGH YIELD FROM THE BULL RUN WATERSHED,
British Columbia Dept. of Municipal Affairs, Victoria. Environmental Planning and Management Div.
For primary bibliographic entry see Field 02A.
W73-14687

3C. Use of Water of Impaired Quality

REPORT ON MAKEUP WATER FOR THE UPPER CANYON LAKES, LUBBOCK, TEXAS.
Freese, Nichols and Endress, Fort Worth, Tex.
For primary bibliographic entry see Field 05G.
W73-14236

ECOLOGICAL RESPONSE OF THE AUSTRALIAN NATIVE SPECIES ACACIA HARPOPHYLLA AND A TRIPLEX NUMMULARIA TO SOIL SALINITY: EFFECTS ON WATER CONTENT, LEAF AREA, AND TRANSPIRATION RATE,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Cunningham Lab.
C. T. Gates.
Australian Journal of Botany, Vol 20, No 3, p 261-272, Dec. 1972. 6 fig, 4 tab, 20 ref.

Descriptors: *Moisture stress, *Transpiration, *Leaves, *Australia, Saline soils, Saline water, Wilting.
Identifiers: *Acacia, *Saltbush.

Described are water relations in response to salinity of the legume Acacia harpophylla (brigalow) and of chenopod Atriplex nummularia (old man saltbush), as well as the response of the latter to associated water stress caused by climatic-geographic locations. Both species tolerated salinities up to and beyond sea water concentration under high insolation stress. The effects of leaf area and leaf number for the two species were different, but both benefited from high salinity in the conservation of their water supply with water content of their tissues being higher, especially that of the laminae. Both showed a reduction in the transpiration per unit of leaf area. A. nummularia plants subjected to water shortage in saline substrates had higher lamina water levels, along with a lesser degree of tissue injury both during wilting and upon recovery. Potassium increased tissue hydration more than sodium in A. harpophylla. (Bahre-Arizona)
W73-14472

THE EFFECT OF GRADUAL LEACHING ON THE GROWTH AND YIELD OF SUGAR CANE IN SALINE SOILS,
M. H. El-Gibaly, and M. Goumah.
United Arab Republic Journal of Soil Science, Vol 11, No 1, p 27-37. 1971. 8 fig, 10 ref.

Descriptors: *Sugarcane, *Saline soils, *Irrigation effects, Crop response, *Leaching, Salinity, *Crop production.
Identifiers: *United Arab Republic.

Sugarcane is the main crop of the southernmost part of the UAR, where aridity and salinity are manifest in many areas. Observations were made on the tolerance of sugarcane when planted in soils of different salt levels and nature. Irrigation every other 10 days dilutes the soil solution and lessens the concentration of salts around the buds and plant roots. A drum culture technique experiment was used to study the effect of integrated leaching on growth and yield of 2 main varieties of sugarcane: CO.310 and CO.413. Tap water was used for irrigation during growth, with the amount of irrigation water slightly above water saturation percentage of the soil to allow relatively little salt leaching from the root zone. This permitted a gradual slow improvement of salinity. Results show that both varieties can grow successfully in saline soil of 0.14 percent salinity providing the gradual leaching of salts. A yield of about 50 to 60 percent and 30-40 percent of the non-saline condition can be obtained from both varieties if the initial soil salinity is 1 percent. CO.413 is more tolerant to initial shocks of salinity than CO.310. Slight salinity increases the sucrose percentage in sugarcane. (Bahre-Arizona)
W73-14473

EFFECT OF SODIUM CHLORIDE SALINITY ON THE WATER BALANCE OF ATRIPLEX HALIMUS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
A. Kaplan, and J. Gale.
Australian Journal of Biological Sciences, Vol 25, No 5, p 895-903, Oct. 1972. 5 fig, 3 tab, 20 ref.

Descriptors: *Water balance, *Salinity, *Sodium chloride, Salt tolerance, Plant physiology, Transpiration, Water loss, Leaves, Turgidity, Hydraulic conductivity, Transpiration control, Halophytes, Evaporation, Photosynthesis, Plant growth, *Australia.
Identifiers: *Saltbush.

Sodium chloride was found to improve the water balance of A. halimus plants under conditions of high evaporative demand. Plants grown in salinized culture solutions improved, with higher values of turgor pressure and percentage saturation value compared with plants grown in the control solutions. A constant water potential gradient was maintained between culture solution and the leaf of plants grown in saline culture solutions whose osmotic potential did not exceed -5 bars. Hydraulic conductivity of the root system appeared to have been impaired by salinity. Improved water balance of plants exposed to salinity could be ascribed to a reduction of transpiration. Improving plant water balance by reducing water loss from leaves so as to only slightly reduce photosynthesis per unit leaf area can be accomplished by increasing leaf turgor which leads in turn to a larger leaf area. The mesophyll resistance factor to the measured transpiration-photosynthesis ratio is discussed. (Bahre-Arizona)
W73-14477

HAZARDS ASSOCIATED WITH THE USE OF CHLORINATED OXIDATION POND EFFLUENTS FOR IRRIGATION,
Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 05D.
W73-14480

EFFECT OF WASTE WATER FROM THE ASTRAKHAN' CELLULOSE AND PASTEBOARD COMBINE ON SOIL PROPERTIES (VLIYANIYE STOCHNYKH VOD ASTRAKHANSKOGO TSELLYULOZNO-KARTONNOGO KOMBINATA NA SVOYSTVA POCHV),
For primary bibliographic entry see Field 05D.
W73-14601

DESCRIPTION OF WATER-SALT RELATIONS OF SOME SOILS IN CENTRAL CISCAUCASIA FROM LYSIMETER EXPERIMENTAL DATA (KHARAKTERISTIKA VODNO-SOLEVOGO REZHIMA NEKOTORYKH POCHV TSENTRAL'NOGO PREDKAVKAZ'YA PO DANNYM LIZIMETRICHESKIKH OPYTOV),
For primary bibliographic entry see Field 02G.
W73-14605

SEWAGE EFFLUENT AND SLUDGE MAKE POSSIBLE REVEGETATION OF STRIP MINE SPOIL BANKS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 05E.
W73-14611

REVEGETATION OF STRIP MINE SPOIL BANKS WITH SEWAGE EFFLUENT AND SLUDGE,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 05E.
W73-14613

3D. Conservation in Domestic and Municipal Use

FUTURE MUNICIPAL AND INDUSTRIAL WATER REQUIREMENTS IN THE QU'APPELLE RIVER BASIN.
Saskatchewan Water Resources Commission, Regina. Investigation and Planning Branch
For primary bibliographic entry see Field 06D.
W73-14231

WATER DISTRIBUTION AND WASTEWATER COLLECTION SYSTEMS IN FORSYTH COUNTY, NORTH CAROLINA WITH URBAN DEVELOPMENT FORECASTS: 1968-1978-2010.
City-County Planning Board, Winston-Salem, N.C.
For primary bibliographic entry see Field 05D.
W73-14233

LANCASTER COUNTY, PENNSYLVANIA COMPREHENSIVE SEWERAGE PLAN.
Huth Engineers, Inc., Lancaster, Pa.
For primary bibliographic entry see Field 05G.
W73-14234

THE ROLE OF URBAN ENGINEERING IN THE NATIONAL WATER POLICY ASSESSMENT,
National Water Commission, Arlington, Va. Engineering and Environmental Sciences Div.
For primary bibliographic entry see Field 06B.
W73-14235

WATER QUALITY MANGEMENT PLAN FOR ALAMEDA CREEK WATERSHED ABOVE NILES.
Brown and Caldwell, San Francisco, Calif.
For primary bibliographic entry see Field 05G.
W73-14237

SHORELINE ANALYSIS OF THE CITY OF SARASOTA.
Smally, Wellford and Nalven, Sarasota, Fla.
For primary bibliographic entry see Field 06B.
W73-14239

CITY OF ESCONDIDO AND VISTA IRRIGATION DISTRICT FEASIBILITY STUDY OF JOINT FILTRATION PROGRAM.
Montgomery (James M.), Inc., La Jolla, Calif.
For primary bibliographic entry see Field 05F.
W73-14240

AREAWIDE COMPREHENSIVE WATER-SEWER PLAN, PART 2, PHASE I, 1970-1995, BREVARD COUNTY, FLORIDA.
Brevard Engineering Co., Cape Canaveral, Fla.
For primary bibliographic entry see Field 05G.
W73-14241

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME V. CAPITAL IMPROVEMENTS PROGRAM,
Diversified Consultants, Inc., Jackson, Miss.
For primary bibliographic entry see Field 05G.
W73-14242

AMARILLO, TEXAS: REPORT ON WATER DISTRIBUTION SYSTEM, 1967.
Freese, Nichols and Endress, Fort Worth, Tex.
For primary bibliographic entry see Field 06D.
W73-14243

PROGRESS ON GEOLOGIC-TERRAIN MAPPING FOR LAND-USE PLANNING IN THE TUCSON AREA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-14348

MUNICIPAL EVALUATION OF REGIONAL WATER QUALITY MANAGEMENT PROPOSALS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-14461

FLOOD CONTROL REPORT, CASA GRANDE, ARIZONA, 1973.
Henningson, Durham and Richardson, Inc., Phoenix, Ariz.
For primary bibliographic entry see Field 04A.
W73-14476

RIVERSIDE'S GROUND WATER PUMPING SYSTEM.
FMC Corp., Los Angeles, Calif. Peerless Pump Div.
For primary bibliographic entry see Field 04B.
W73-14478

A COMPARISON OF URBAN WATER USE IN AUSTRALIA AND THE U.S.,
Swinburne Coll. of Tech., Hawthorn (Australia).
For primary bibliographic entry see Field 06D.
W73-14483

MIDDLETOWN STREAMBELT REPORT.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W73-14484

A PRELIMINARY BASELINE STUDY OF ROBERTS AND STURGEON BANKS,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 05A.
W73-14486

A PRELIMINARY WATER QUALITY SURVEY OF THE LOWER FRASER RIVER SYSTEM,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 05A.
W73-14487

SKETCH REGIONAL WATER AND SEWER PLAN.
Neuse River Regional Planning and Development Council, New Bern, N.C.

Available from the National Technical Information Service as PB-214 015; $10.00 in paper copy, $1.45 in microfiche. June 1972. 157 p, 20 maps. NCP-146 NM-7.

Descriptors: *Planning, *Water supply, *Sewerage, Coordination, Financing, Regional development, Urbanization, Water demands, *North Carolina, Census, *Regional analysis.
Identifiers: Utility systems extension, *Neuse River (NC).

Basically a planning prospectus for water supply and wastewater disposal systems in the nine county Region P in eastern North Carolina, this report gives a general description of the region including population and economic analyses, outlines the basic water resources needs, presents a county-by-county inventory of existing and proposed water and sewer systems, and offers general recommendations for future planning. The focus of many of the recommendations is on a 'regional planning concept' in which several small systems would be consolidated or interconnected and county authorities would be created to coordinate water and sewer system planning and implementation. On the other hand, since much of the region is quite rural, recommendations also include the use of Farmer's Home Administration grants for small water supply systems and use of better practices in controlling and locating septic tanks. Municipal and county authority for financing and constructing water and sewer facilities is discussed. (Elfers-North Carolina)
W73-14488

STUDY DESIGN FOR A REGIONAL SEWER AND WATER PLAN.
Cuyahoga County Regional Planning Commission, Cleveland, Ohio.

August 1971. 35 p, 2 fig. HUD Ohio P-258-20.

Descriptors: *Planning, Coordination, Water distribution (Applied), Waste water disposal, Storm drains, *Ohio, *Regional analysis, Social participation, Water supply.
Identifiers: *Citizen participation, Capital improvements program, Utility extension, *Cuyahoga County (Ohio), Advisory committees.

The role of the Cuyahoga County Regional Planning Commission in developing plans for water distribution and waste water collection is outlined. Emphasis is on the relationship of Commission activities to those of several other agencies responsible for utility construction and planning. Goals and objectives for the County, sewerage planning, water supply planning, and storm drainage planning are discussed. Key sections of the report are those covering the implementation of the plans, including a capital improvements program, the integration of plans from several agencies, and citizen participation in the planning process, particularly via advisory committees and public meetings. Preliminary estimates for staging and cost breakdown and a tentative time schedule are provided. (Elfers-North Carolina)
W73-14489

LANCASTER COUNTY PLANNING COMMISSION: STORM DRAINAGE STUDY.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 08B.
W73-14490

FLOOD HAZARD STUDY.
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.
For primary bibliographic entry see Field 06F.
W73-14491

WATER, SEWER, AND STORM DRAIN STUDY, UTAH COUNTY, UTAH, VOLUME I: BACKGROUND AND INVENTORY.
Despain (I. Dale) and Associates, Provo, Utah.
For primary bibliographic entry see Field 05D.
W73-14492

WATER, SEWER AND STORM DRAIN STUDY, UTAH COUNTY, UTAH: VOLUME II, PLAN REPORT.
Despain (I. Dale) and Associates, Provo, Utah.
For primary bibliographic entry see Field 05D.
W73-14493

REPORT ON HALF MOON LAKE.
Half Moon Lake Restoration Committee, Eau Claire, Wis.
For primary bibliographic entry see Field 05G.
W73-14494

DES PLAINES RIVER VALLEY: GOALS, POLICIES, AND RECOMMENDATIONS.
Des Plaines River Valley Comprehensive Plan Steering Committee, Ill.
For primary bibliographic entry see Field 06F.
W73-14495

WATER AND LIQUID WASTE MANAGEMENT: POLICIES, SYSTEMS PLANS, PROGRAM.
Tulare County Planning Dept., Visalia, Calif.
For primary bibliographic entry see Field 05G.
W73-14497

WATER AND LIQUID WASTE MANAGEMENT: POLICIES, SYSTEMS PLANS, PROGRAM--PART II.
Tulare County Planning Dept., Visalia, Calif.
For primary bibliographic entry see Field 05G.
W73-14498

WATER RESOURCES OF MIDDLE GEORGIA.
Briley, Wild and Associates, Daytona Beach, Fla.
For primary bibliographic entry see Field 06D.
W73-14499

MASTER PLAN FOR STORM DRAINAGE: FORT WAYNE-NEW HAVEN-ALLEN COUNTY METROPOLITAN AREA.
Schnelker (Philip L.), Inc., Fort Wayne, Ind.
For primary bibliographic entry see Field 06B.
W73-14500

AMARILLO, TEXAS: REPORT ON SANITARY SEWERAGE AND SEWAGE TREATMENT, 1967.
Freese, Nichols and Endress, Fort Worth, Tex.
For primary bibliographic entry see Field 05D.
W73-14501

REALITIES OF URBAN WATER RESOURCES OPERATING PERSPECTIVE,
Washington Suburban Sanitary Commission, Hyattsville, Md.
R. J. McLeod.
Paper presented at American Society of Civil Engineers, Annual Water Resources Meeting, Washington, D.C., January 29-Feb. 2, 1973. 8 p.

Descriptors: Water resources development, *Water supply development, *Water policy, *Water distribution (Applied), Water delivery, Water management (Applied), Planning, Forecasting, Water allocation (Policy), *Political aspects.

Many of the problems of water supply utilities are the result of political planning and policy decisions. In carrying out the political decisions, problems arise, and the complaints of the public are directed toward the utility, not the politicians. One problem is that planning and policy processes are not totally accurate. Planning for an expected growth of a given population with a certain distribution may prove to be inadequate, causing either shortages, or an excess capacity. With the change in selected officials can come changes in the goals of local government and, hence, a change in policy for the utility to follow. Another problem

can be the lack of cooperation of different levels of government. While some water resource projects may require only local support, other projects may require regional, state, or federal cooperation. Slow action on the part of a governmental unit can bring many problems to the local utility. Lack of financial support can cause further problems. Money is sometimes promised, but not supplied. Wastewater treatment facilities suffer similar problems. Additional problems exist in knowing what levels of water quality will be required in the future, and how municipal wastewater treatment will fit in with other forms of pollution--such as erosion, urban runoff, and agricultural runoff. (Poertner)
W73-14614

WATER RESOURCES IN SANTA CLARA COUNTY: A PLAN FOR CONSERVATION,
M. Johnson.
Prepared for Santa Clara County Association of Resource Conservation Districts and South Santa Clara Valley Water Conservation District, 1973. 59 p, 9 fig, 13 tab, 53 ref.

Descriptors: *Water management, *Conservation, Coordination, Water resources development, Administration, Water supply, Sewerage, Water quality, Recreation, Urbanization, *Planning, *California.
Identifiers: *Santa Clara County (Calif), Countywide planning, Public participation.

Santa Clara County is an area of 1300 square miles, 60% of which is in hills and mountains, containing 1.1 million people and the fourth largest city in California. Since water resources management is a total system approach, the county should take the initiative in providing integrated, countywide water resources development and conservation. Such integrated management is seen to include (1) water supply, distribution, and use, (2) sewage collection, treatment, and disposal, (3) storm and flood waters, (4) water storage, including groundwater storage, (5) water quality, (6) the reclamation and reuse of wastewater, (7) relationships to other planning sectors such as land use, health and safety, recreation, and open space, and (8) institutions and intergovernmental relations. Each of these topics is discussed with the emphasis often on agencies involved, planning interrelationships, public attitudes and goals, or socioeconomic aspects. A very detailed outline is presented of proposed goals and policies for management of water resources in the county. Policies include such topics as future growth, consolidation of governmental authority, wetlands, water supply sources, water quality, and public participation. (Elfers-North Carolina)
W73-14675

RIVERFRONT DEVELOPMENT PLAN, CONNECTICUT RIVER, SPRINGFIELD, MASSACHUSETTS.
Springfield Planning Dept., Mass.

January, 1973. 16 p, 6 fig, append.

Descriptors: *Recreation, *Connecticut River, *Massachusetts, *Planning, Parks, Aesthetics, Urban renewal, Water quality, Environmental effects, Land use, Access routes.
Identifiers: *Waterfront planning, Esplanade, *Springfield (Mass).

The City of Springfield has historically depended on the Connecticut River for transportation and commerce, but at present much of the urban waterfront is either unused or deteriorating. However, with the new interest in water quality and environmental quality there is a great opportunity to make the river a significant asset to the metropolitan area again. Intended to establish a general framework for planning and development of the waterfront, this study consists of basic goals and policies and more specific proposals for development in six different waterfront areas. The goals include the achievement of a 'B' water quality classification for the entire stretch of the river within the metropolitan area, the improvement of public access to the waterfront, the acquisition and provision of recreation facilities all along the waterfront, and the enhancement of the scenic quality of the waterfront. One key concept to achieve these goals is the proposal of an esplanade, or a broad walkway, to follow the river and connect various public and recreational areas. Each of six planning areas are described in more detail, outlining specific recreation projects and land use locations. (Elfers-North Carolina)
W73-14676

RIVERBANKS IMPROVEMENT PROGRAM, (BROOME AND TIOGA COUNTIES, N.Y.).
Broome County Planning Dept., Binghamton, N.Y.; and Southern Tier East Regional Planning Board, Binghamton, N.Y.

February, 1972. 20 p, 6 fig, 3 append.

Descriptors: *Planning, *Recreation, *Flood plains, *Parks, Environmental effects, Water quality, Rivers, Urbanization, Coordination, *New York.
Identifiers: *Riverbanks, Open spaces, Susquehanna River, *Binghamton (N.Y.).

A summary is presented of the Riverbanks Program being carried out by the counties of Broome and Tioga covering approximately 120 miles of riverbank areas. The main river involved is the Susquehanna but four other streams, the Chenango, Delaware, Otselic, and Tioughnioga, also flow through the two-county region. The riverbanks and valleys are significant recreational and aesthetic resources in the region and are threatened by rapid urbanization, especially in the Binghamton metropolitan area. Problems include loss of open space, development on floodplains, deteriorating water quality, and changing groundwater levels. The Riverbanks Program is based on abundant data including Army Corps of Engineers reports, state and federal funding, and strong local support. Some of the policies included in the Program are: (1) key feature of the regional open space plan should be water and riverbank recreation; (2) the county governments should take the lead in developing the recreation potential; (3) large areas of riverbanks should be placed in public ownership; (4) land use standards and controls should be adopted for floodway areas; and (5) ecological balance of riverbank areas should be considered. In the first action under the Program, Broome County designated an acquisiton zone along the Susquehanna River and began purchasing land. (Elfers-North Carolina)
W73-14678

WATER SUPPLY PLAN (REVISED) FOR COLUMBUS-FRANKLIN COUNTY,
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 06D.
W73-14679

HOWARD COUNTY, INDIANA: COMPREHENSIVE WATER AND SEWER PLAN.
Hamilton (Ernest R.) Associates, Inc., Indianapolis, Ind.

Prepared for Howard County Plan Commission, Kokomo, Indiana, April, 1970. 71 p, 13 fig, 30 tab.

Descriptors: *Planning, *Water supply, *Sewerage, Soil types, Septic tanks, Urbanization, Regulation, *Indiana.
Identifiers: *Howard County (Ind.), Data inventories, Comprehensive development plan, Subdivision regulations.

This study was sponsored by the Farmers Home Administration and covers all of Howard County except the city of Kokomo. The report is divided into two parts: the first is a presentation of data and maps on the natural resources of the county, its population, economy, land use, community facilities, and utilities; the second part outlines a general planning strategy for providing water and sewer facilities to the county. The two key factors on which the study was based are the significant urbanization taking place in the county and the ability of various soils to support private septic tanks and wells. It is recommended that the county adopt subdivision regulations dealing with septic tanks and surface drainage, that the areas of Russiaville, West Middleton, and Greentown begin to develop public water and sewer systems, and that a comprehensive development plan be formulated to help guide urbanization in the rest of the county away from poor soils. (Elfers-North Carolina)
W73-14680

WATER AND WASTEWATER PLAN FOR ANDERSON, BLOUNT, AND KNOX COUNTIES, TENNESSEE - VOLUME I, WATER SUPPLY AND DISTRIBUTION.
Allen and Hoshall, Memphis, Tenn.
For primary bibliographic entry see Field 05G
W73-14682

WATER AND WASTEWATER PLAN FOR ANDERSON, BLOUNT, AND KNOX COUNTIES, TENNESSEE - VOLUME II, WASTEWATER COLLECTION AND TREATMENT.
Allen and Hoshall, Memphis, Tenn.
For primary bibliographic entry see Field 05G.
W73-14683

HYDROLOGIC SIMULATION.
Lake County Regional Planning Commission, Waukegan, Ill.
For primary bibliographic entry see Field 04A.
W73-14685

THE URBAN RIVER: A STAFF PROPOSAL FOR WATERFRONT DEVELOPMENT IN THE DISTRICT OF COLUMBIA.
National Capital Planning Commission, Washington, D.C.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 - Price $2.50. December 1972. 49 p, 29 fig, photos, 2 append.

Descriptors: *Land use, *Aesthetics, *Recreation, *City planning, Planning, Scenery, Parks, Landscaping, Rivers, Potomac River, Anacostia River, *District of Columbia.
Identifiers: *Waterfront planning.

Although there has been a growing concern for problems of water quality, sedimentation, and flooding of our rivers there has been much less interest in the quality of urban riverfront areas. Focusing on the waterfront areas of the Potomac and Anacostia Rivers within the District of Columbia, this study includes an analysis of historical development and present conditions in the waterfront areas and suggests numerous general policies and specific objectives for the development and redevelopment of these areas. Some of the policies include the preservation of the historical character of much of the waterfront, the encouragement of a variety of land uses, the increasing use of open areas outside the District of Columbia for recreation, and an effort to make the rivers and riverfronts more accessible to city residents and visitors. Detailed studies of specific waterfront areas are proposed and it is recommended that the Georgetown and Anacostia waterfronts be acted on first. The impact of the improvement policies on specific features of the waterfront such as Buzzard Point, National Airport, George Washington

Memorial Parkway, Rock Creek, and Key Bridge is discussed. (Elfers-North Carolina)
W73-14686

BETTER WATER FOR PEOPLE IN LAS VEGAS,
Las Vegas Valley Water District, Nev.
For primary bibliographic entry see Field 05G.
W73-14688

3E. Conservation in Industry

FUTURE MUNICIPAL AND INDUSTRIAL WATER REQUIREMENTS IN THE QU'APPELLE RIVER BASIN.
Saskatchewan Water Resources Commission, Regina. Investigation and Planning Branch.
For primary bibliographic entry see Field 06D.
W73-14231

3F. Conservation in Agriculture

EFFICIENCY OF WATER USE AS INFLUENCED BY MICROMETEOROLOGICAL AND PHYSIOLOGICAL PROCESSES,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02D.
W73-14206

DENTRIFICATION BY ANAEROBIC FILTERS AND PONDS - PHASE II.
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
For primary bibliographic entry see Field 05D.
W73-14219

PROCEEDINGS - SIXTEENTH ANNUAL WATER CONFERENCE.
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W73-14224

RENOVATING SEWAGE EFFLUENT BY GROUNDWATER RECHARGE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 05D.
W73-14225

PROCEEDINGS OF THE THIRD ANNUAL CONFERENCE ON REMOTE SENSING IN ARID LANDS.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 07B.
W73-14326

APPLICATION OF A DIRECTIONAL REFLECTANCE MODEL TO WHEAT CANOPIES UNDER STRESS,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 07B.
W73-14334

THE KIN BINEOLA IRRIGATION STUDY: AN EXPERIMENT IN THE USE OF AERIAL REMOTE SENSING TECHNIQUES IN ARCHAEOLOGY,
New Mexico Archeological Center.
For primary bibliographic entry see Field 07B.
W73-14343

REMOTE SENSING OF IRRIGATION TECHNIQUES AND CROP PATTERNS IN THE DOUGLAS BASIN, ARIZONA,
For primary bibliographic entry see Field 07B.
W73-14350

WATER FLOW IN SOIL IN PRESENCE OF SOYBEAN ROOT SINKS,
Minnesota Univ., Minneapolis. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-14367

A MATHEMATICAL MODEL OF WATER ADVANCE AND FLOW IN SMALL EARTH CHANNELS,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-14369

RUNOFF, EROSION, AND TILLAGE EFFICIENCY ON GRADED-FURROW AND TERRACED WATERSHEDS,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
For primary bibliographic entry see Field 04D.
W73-14410

A MATHEMATICAL INVESTIGATION OF STEADY INFILTRATION FROM LINE SOURCES,
Colorado State Univ., Fort Collins. Dept. of Mathematics.
For primary bibliographic entry see Field 02G.
W73-14425

CHARACTERISTICS OF THE SOIL MATRIX THAT AFFECT WATER STORAGE AND MOVEMENT,
Minnesota Univ., Minneapolis. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-14467

STRESS METABOLISM. II: CHANGES IN PROLINE CONCENTRATION IN EXCISED PLANT TISSUES,
Waite Agricultural Research Inst., Glen Osmond (Australia). Dept. of Plant Physiology.
T. N. Singh, D. Aspinall, L. G. Paleg, and S. F. Boggess.
Australian Journal of Biological Sciences, Vol 26, No 1, p 57-63, Feb 1973. 4 fig, 12 ref.

Descriptors: *Amino acids, *Metabolism, *Moisture stress, *Barley, *Plant tissues, Plant growth regulators, Stress analysis, Water supply, Biochemistry, Plant physiology, Plant growth, Planting management, Hydrolosis.

This paper, second in a series on stress metabolism, explores the capacity of the various barley plant organs to accumulate free proline when isolated from the rest of the plant and subjected to a water stress under aerobic conditions. Shoot apices and excised root systems, and sections of the lamina and leaf sheath of the first leaf of 10-day barley plants were incubated on aerated polyethylene glycol solution or distilled water. The imino acid proline accumulated rapidly in the leaf lamina sections subjected to osmotic stress and less rapidly, after a delay of 16 hours, in those floated on water. Leaf sheath sections apices showed on increase in free proline content on either medium. Albino leaf sections accumulated no proline when floated on water or in the solution unless supplied with precursors for proline biosnythesis. Green tissue, however, accumulated a high concentration of proline on the solution alone. Neither chlorophyll nor functional chloroplasts are essential, therefore, for proline accumulation during water stress. (See W73-14004, W73-14504 and W73-14505) (Bahre-Arizona)
W73-14503

STRESS METABOLISM. IV: THE INFLUENCE OF (2-CHLOROETHYL) TRIMETHYLAMMONIUM CHLORIDE AND GIBBERELLIC ACID ON THE GROWTH AND PROLINE ACCUMULATION OF WHEAT PLANTS DURING WATER STRESS,
Waite Agricultural Research Inst., Glen Osmond (Australia). Dept. of Plant Physiology.
T. N. Singh, D. Aspinall, and L. G. Paleg.
Australian Journal of Biological Sciences, Vol 26, No 1, p 77-86, Feb 1973. 4 fig, 2 tab, 22 ref.

Descriptors: *Amino acids, *Metabolism, *Moisture stress, *Wheat, *Plant growth substances, Osmotic pressure, Varieties, Hydrolysis, Proteins, Agricultural chemicals, Growth rates.

Rate and extent of proline accumulation under comparable water stress conditions varies, the potential appearing to vary directly with the ability of the genotype to yield under drought conditions in the field, and to recover after severe osmotically-induced stress. Wheat plants (cv. Gabo) were grown in nutrient solution, with results indicating that neither CCC nor GA3 influenced leaf water potential, which fell rapidly following exposure to elevated osmotic pressure in the rooting medium. CCC reduced plant dry weight, apex elongation, and shoot elongation, but had no effect on primordium formation on the apex. Water stress inhibited growth at the apex and shoot elongation; but these effects were undiminished by previous growth-retardant treatment. GA3, however, promoted both growth attributes even where growth had been completely inhibited previously by water stress and leaf water potential was falling rapidly. Free proline accumulation was promoted by previous CCC application in all plant organs, when subjected to water stress, but a reduction relieved accumulated proline as did application of GA3. Neither CCC nor GA3 varied the concentration of free proline in leaves of plants not subjected to water stress. (See also W73-14503) (Bahre-Arizona)
W73-14505

STRESS METABOLISM. III: VARIATIONS IN RESPONSE TO WATER DEFICIT IN THE BARLEY PLANT,
Waite Agricultural Research Inst., Glen Osmond (Australia). Dept. of Plant Physiology.
T. N. Singh, L. G. Palag, and D. Aspinall.
Australian Journal of Biological Sciences, Vol 26, No 1, p 65-76, Feb 1973. 5 fig, 5 tab, 29 ref.

Descriptors: *Amino acids, *Metabolism, *Moisture stress, *Barley, *Chlorophyll, Leaves, Plant growth regulators, Soil-water-plant relationships, Hydrolysis, Growth rate, Environmental control.

Barley plants (cv. Prior) grown in a controlled environment were subjected to 1, 2, or 3 cycles of water stress interspersed with periods of adequate supply. Stress-induced fall in leaf water potential was unaffected by previous drought history. After each deficit period, leaf water potential recovered rapidly to the level of plants not stressed. Chlorophyll content declined during stress, but recovered between stress periods. Previous exposure to stress lowered this decline. In contrast, free proline increased during stress and declined in the intervals. Here, previous exposure to stress increased the potential for proline accumulation in tissue. Responses of 14 different barley varieties to water stress were assessed. There were substantial varietal differences in proline accumulation related to leaf survival during stress and plant growth rate following stress. Varieties accumulating larger concentrations tended to have leaves

that survived extreme water stress more readily and grew more rapidly following stress relief. (See also W73-14503) (Bahre-Arizona)
W73-14506

ECONOMIC ASPECTS OF SLOPING LAND DRAINAGE,
Agricultural Research Service, Burlington, Vt. Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W73-14523

EFFECT OF TEMPERATURE AND HUMIDITY STRESS DURING FLOWERING ON SAFFLOWER (CARTHAMUS TINCTORIOUS L.),
Agricultural Research Service, Tucson, Ariz. Plant Science Research Div.
L. H. Zimmerman.
Crop Sci. Vol 12, No 5, p 637-640. 1972.
Identifiers: Carthamus-tinctorius, Flowering, Genotype, *Humidity, *Safflower, Stress, *Temperature.

Sensitivity of safflower during flowering to temperature and humidity stress and genetic variation for such sensitivity has been in question. Cultivars were grown in the greenhouse under similar conditions except for a 24-hr period during anthesis when they were exposed to temperature and humidity differentials in controlled environment chambers. Plants were exposed to these differentials on the day the second sequentially developing head began blooming, thus enabling measurement of sensitivity to temperature and humidity stress during pre-, post-, and anthesis stages of head development. Heads in anthesis and pre-anthesis were the most sensitive to temperature and humidity stresses. Cultivars responded differently to the stresses for seed number, weight, and yield. Results of the experiment suggest that screening safflower genotypes for tolerance to temperature and humidity stress using controlled environment chambers is practical and 24-hr exposure during anthesis is sufficient to differentiate genotypes.--Copyright 1973, Biological Abstracts, Inc.
W73-14547

ANALYSIS OF MONTHLY RAINFALL PROBABILITIES BY WEIGHTED TRANSFORMATION,
Engineering Consultants, Inc., Denver, Colo.
For primary bibliographic entry see Field 02A.
W73-14565

EFFECTS OF TREES AND FORESTS IN NEUTRALIZING WASTE,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 05D.
W73-14610

SPRAY IRRIGATION OF SEWAGE EFFLUENT AND SLUDGE,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 05D.
W73-14612

WHAT INVESTIGATIONS ARE REQUIRED TO OBTAIN INTENSIVE AND HEAVY-YIELD VARIETIES OF WINTER WHEAT,
Polish Academy of Sciences, Warsaw. Inst. on Agricultural and Forestry Economics.
T. Ruebenbauer.
Postepy Nauk Roln. Vol 18, No 4, p 5-14. 1971. Illus.
Identifiers: Breeding, *Drought resistance, *Wheat varieties, *Crop yield, Winter-hardiness.

Short-strawed varieties of wheat are susceptible to drought and lack winterhardiness. They should be bred for a greater water potential. Attempts should be made to break the correlation between short-strawed varieties and nonresistance to drought. Winterhardiness of short-strawed varieties needs to be improved. With 5 genes conditioning this trait, it is possible to produce hybrids excelling the parts.--Copyright 1973, Biological Abstracts, Inc
W73-14616

MODELLING TECHNIQUES FOR A SYSTEM ENGINEERING APPROACH OF THE PROBLEMS OF WATER USES FOR AGRICULTURAL PURPOSES,
Padua Univ. (Italy). Instituto di Elettrotecnica e di Elettronica.
For primary bibliographic entry see Field 08B.
W73-14673

FIBERGLASS PLASTIC CASING OVERCOMES CORROSION PROBLEM IN WATER WELLS IN WEST PAKISTAN,
Tepton and Kalmbach, Inc., Denver, Colo.
For primary bibliographic entry see Field 04B.
W73-14722

EFFECTS OF WATER STRESS, GIBBERELLIC ACID AND 2-CHLOROETHYLTRIMETHYLAMMONIUMCHLORIDE (CCC) ON FLOWER DIFFERENTIATION IN 'EUREKA' LEMON TREES,
Hebrew Univ., Rehovoth (Israel). Dept. of Agricultural Botany.
For primary bibliographic entry see Field 02I.
W73-14737

EFFECTS OF BLACK POLYETHYLENE MULCH ON SOIL TEMPERATURE, SOIL MOISTURE, WEED DENSITY AND YIELD OF MULBERRY LEAF UNDER DRY FARMING CONDITIONS IN MYSORE STATE,
Central Sericulture Research Training Inst., Mysore (India).
K. Kasiviswanathan, M. N. Sitarama Iyengar, and S. Krishnaswami.
Indian J Seric, Vol 10, No 1, p 90-95, 1971.
Identifiers: Density, Dry farming, *India, Moisture, *Mulberry leaf, *Mulch, Mysore, *Soil temperature, Weed, Yield.

In Mysore, India, where more than 4/5 of the mulberry area is grown under scanty rainfall conditions as a dry crop, leaf production is meager in Dec.-April due to inadequate soil moisture. The plastic cover was efficient in retaining moisture. Mulberry production increased by as much as 43% and leaf quality improved.--Copyright 1973, Biological Abstracts, Inc.
W73-14748

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

PROCEEDINGS - SIXTEENTH ANNUAL WATER CONFERENCE.
New Mexico State Univ., University Park. Water Resources Research Inst.

Available from the National Technical Information Service as PB-223 379, $5.25 in paper copy, $1.45 in microfiche. Proceedings held at Las Cruces, New Mexico, March 25-26, 1971, 197 p. OWRR A-999-NMEX (6).

Descriptors: *Water resource development, Engineering, *Planning, *Management, *Water law, Sewage disposal, *Irrigation, Systems analysis, Sediment, Herbicides, Corn, New Mexico, Texas, Arizona, Antitranspirants, Tamarisk.
Identifiers: Cochiti Dam, Navajos, Rio Grande.

Water is the most limiting resource in New Mexico and the water that we have is the State's greatest asset. Surface and subsurface water is used to supply growing municipal and industrial demands and to irrigate the land. According to the Senate Select Committee Report of 1961 and the Water Resources Council Report of 1968, a major part of the State is facing the most critical shortage of water in relation to projected demands of any other area of the Nation. In addition to papers discussing New Mexico's specific water problems, other papers dealt with renovating sewage effluent, systems analysis in water resource management, irrigation of corn, Arizona's water problems, antitranspirants, sediment, herbicides, irrigation, consumptive requirements, water and the Navajos, and water law.
W73-14224

ANTITRANSPIRANTS: A POSSIBLE ALTERNATIVE TO THE ERADICATION OF SALTCEDAR THICKETS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 03B.
W73-14226

GULL LAKE-WATER LEVEL STABILIZATION.
Red Deer Regional Planning Commission (Alberta).
For primary bibliographic entry see Field 06E.
W73-14232

FLOOD PLAIN INFORMATION, CLARKSVILLE, TENNESSEE.
Army Engineer District, Nashville, Tenn.

Prepared for the City of Clarksville, Tenn. 1964. 26 p, 12 plates, 4 tab, 11 ref, glossary.

Descriptors: *Flood control, *Flood data, Flood plains, Flood damage, Flood protection, Urbanization, *Tennessee.
Identifiers: *Flood plain management, Cumberland River, Clarksville (Tenn), Army Corps of Engineers, Red River (Tenn).

Flood losses in Clarksville from the Cumberland River and the Red River have been relatively small in the past. This is largely due to the existence of three Corps of Engineers reservoirs in the headwaters of the Rivers and the few number of residences located in the flood plain areas of the City. As urban growth and renewal continues, strong pressures are emerging to build on the flood plain. Past floods in the area and areas of potential flood hazard are described. There are numerous maps, cross section diagrams, and charts illustrating past flooding problems and photographs indicating levels of potential floods in relation to existing development. Non-structural flood control measures such as existing flood protection measures including flood warning and emergency evacuation plans and guidelines for reducing future flood damages with emphasis on flood plain management are briefly discussed. Recommendation is made for careful study to determine the relative economy of restricting and, in some cases prohibiting, construction which would be subject to flooding. Other considerations must also be studied before objective flood plain management can be initiated to balance the economic and aesthetic needs of a community with the natural demands of two active rivers. (Elfers-North Carolina)
W73-14238

AMARILLO, TEXAS: REPORT ON WATER DISTRIBUTION SYSTEM, 1967.
Freese, Nichols and Endress, Fort Worth, Tex.
For primary bibliographic entry see Field 06D.
W73-14243

A GENERAL SPATIAL MODEL: I. APPLICATION OF EFFICIENT LAND USE,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
B. St Clair-Corcoran.
J Hydrol (Dunedin), Vol 10, No 2, p 127-132, 1971.
Identifiers: *Land use, Model studies, *Spatial models, *Negentropy.

A new energy form is postulated from which a general model is synthesized. This general model uses the idea of hydrological efficiency constants to consider the question of efficient land use practice. The negentropy of water (the empirical measure of the efficiency of distribution of the usable energy of water) is referred to as a hydrological efficiency constant, and it is noted that the negentropy of water is a sensitive indicator of the stability of a given society in real terms.--Copyright 1973, Biological Abstracts, Inc.
W73-14257

PROCEEDINGS OF THE THIRD ANNUAL CONFERENCE ON REMOTE SENSING IN ARID LANDS.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 07B.
W73-14326

BASIC CONSIDERATIONS OF HIGH RESOLUTION SIDE-LOOKING RADAR IMAGERY,
Goodyear Aerospace Corp., Litchfield Park, Ariz. Sensor Applications Engineering.
For primary bibliographic entry see Field 07B.
W73-14332

THE APPLICATION OF RADAR AND INFRARED IMAGERY TO QUANTITATIVE GEOMORPHOLOGICAL PROBLEMS,
Texas Univ., Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 07B.
W73-14333

THE USE OF REMOTE SENSING TECHNIQUES IN THE ARID LANDS OF AUSTRALIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 07B.
W73-14335

COMPARATIVE EVALUATION OF THERMAL PROFILE DATA OF HEALTHY AND INFESTED ENGLEMANN SPRUCE,
Forest Service (USDA), Phoenix, Ariz. Bureau of Pest Control.
For primary bibliographic entry see Field 07B.
W73-14337

THE APPLICATION OF SPACE IMAGERY TO ANTHROPOLOGY,
New Mexico Archeological Center.
For primary bibliographic entry see Field 07B.
W73-14342

MONITORING THE EFFECTS OF A CHANGING RESOURCE BASE IN AN ARID LANDS AREA: THE WEST SIDE OF THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 07B.
W73-14345

AUTOMATED PLOTTING AND UPDATE OF LAND USE MAPS AND RELATED INFORMATION IN SOUTH CENTRAL ARIZONA,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 07C.
W73-14347

PROGRESS ON GEOLOGIC-TERRAIN MAPPING FOR LAND-USE PLANNING IN THE TUCSON AREA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-14348

A MATHEMATICAL MODEL OF WATER ADVANCE AND FLOW IN SMALL EARTH CHANNELS,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
D. L. Bassett, and D. K. McCool.
Available from the National Technical Information Service as PB-223 433, $2.75 in paper copy, $1.45 in microfiche. Project Completion Report, July 12, 1973. 22 p, 2 fig, 6 ref. OWRR A-053-WASH (1). 14-31-0001-3848.

Descriptors: *Mathematical models, *Furrow irrigation, *Computer programs, *Open channel flow, Flow, Equations, Boundaries (Surfaces).

The objective was the development of a mathematical model of unsteady, spatially varied open channel flow in small earth channels. Furrow irrigation, a notable example of such flow, was used to illustrate the development. During this first year the mathematical basis of the model was prepared. This involved the complete partial differential equations of continuity and momentum written for small earth channels where infiltration into the channel bed depletes the flowing stream. Since the equations cannot be solved in closed form a procedure was prepared for obtaining approximate solutions by numerical methods. This procedure uses the method of characteristics on a fixed rectangular grid. Description was prepared for the five sets of boundary conditions that can occur in furrow irrigation. A preliminary description of water movement into the channel bed and walls was developed. These and other provisions have been assembled into a model and associated digital computer program which describes the complete furrow irrigation process. Provision is included to describe the disposal of water within and from the channel that will result from given flow conditions. The model is operational and is now being tested and revised as needed.
W73-14369

THEORY OF A RECTANGULAR GRAVEL ENVELOPE IN DRAINAGE DESIGN,
Iowa State Univ., Ames. Dept. of Agronomy.
D. Kirkham, and M. S. Selim.
Soil Science Society of America Proceedings, Vol 37, No 4, p 517-521, July-August 1973. 5 fig, 5 tab, 8 ref. NSF Grant GK-31137.

Descriptors: *Subsurface drains, *Subsurface drainage, Soil water movement, Equations.
Identifiers: Gravel-packed drain tubes.

A theory was developed to determine the radius of a circular drain which is equivalent to a square drain. A square drain is encountered in practice when a gravel envelope of square cross section is placed around a subsurface circular drain. The resistance of the gravel to flow was neglected. The square drain tube was analyzed for two cases: (1) when an impermeable barrier was at great depth below the square drain tube center, and (2) when the bottom edge of the square drain tube lay on a plane impermeable barrier. In both cases it was assumed that the length of the edge of the square drain tube was small compared with the distance from the drain's center to a water table over the drain, and that the drain ran full. For case 1 an equivalent circular drain tube of radius 1.1772 times the half-width of the square drain tube may be used to replace the square drain tubes. If the square drains lie on the impervious layer, as in case 2, the radius of the equivalent circular drain is 1.1037. (Knapp-USGS)
W73-14420

PROBLEMS OF WATER RESOURCES USE AND CONSERVATION (PROBLEMY VODNYKH RESURSOV, IKH ISPOL'ZOVANIYA I OKHRANY),
Institute of Geography of Siberia and the Far East, Irkutsk. (USSR).
For primary bibliographic entry see Field 06B.
W73-14427

HYDROLOGIC REGIME OF CONIFEROUS BROAD-LEAVED FOREST TREES IN THE SOUTHERN MARITIME TERRITORY (GIDROLOGICHESKIY REZHIM KHVOYNO--SHIROKOLISTVENNYKH LESOV YUZHNOGO PRIMOR'YA),
Akademiya Nauk SSSR, Vladivostok. Institut Biologii.
For primary bibliographic entry see Field 02I.
W73-14432

FLOW REGULATION FOR WATER QUALITY MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
W73-14466

SOME FACTORS INFLUENCING TOLERANCE TO MOISTURE STRESS OF THREE RANGE GRASSES,
Idaho Univ., Moscow. Forest, Wildlife and Range Experiment Station.
E. F. Schlatterer, and M. Hironaka.
Journal of Range Management, Vol 25, No 5, p 364-367, Sept. 1972. 3 tab, 5 ref.

Descriptors: *Moisture stress, *Range grasses, *Drought tolerance, *Soil-water-plant relationships, Seeds, Planting management, Nutrients, Plant growth, Temperature control, Growth rates, Nitrogen.

Pre-conditioning of bluebunch wheatgrass, squirreltail, and Thurber stipa plants by exposure to different temperatures and watering schedules, as well as soil types, affected their tolerance to moisture stress. Vigor of seedlings in mound soil was greater than for intermound soil during the first 11 weeks as suggested by plant height and weight. This was attributed to higher nutrient availability, particularly nitrogen. Reversal in growth response occurred during the 5-week moisture stress period. Plants on less fertile intermound soil produced more regrowth than those on mound soil. Conditioning of plants to stress eas affected by soil. Within limits, growing conditions less than optimum tend to produce plants able to tolerate greater moisture stress. Pre-conditioning of plants to resist or withstand moisture stress should be considered where availability of moisture is a major concern. (Bahre-Arizona)
W73-14475

FLOOD CONTROL REPORT, CASA GRANDE, ARIZONA, 1973.
Henningson, Durham and Richardson, Inc., Phoenix, Ariz.

June 25, 1973. 47 p, 5 tab, 10 plates. HUD-701. CPA-AZ-09-16-1008.

Descriptors: *Flood control, *Drainage engineering, *Lateral conveyance structures, *Urban drainage, *Project planning, *Arizona, Arid climates, Design flood, Surface runoff, Flood routing, Cost analysis.
Identifiers: *Casa Grande (Ariz).

Situated in the south-central portion of Arizona in the Sonoran Desert, the city of Casa Grande lies at an elevation of 1500 feet with a slope down to approximately 1200, and is drained by many arroyos and washes, with alluvial fill characterizing the surrounding areas. The climate is typical of the arid desert region, with high summer temperatures, and both winter and summer precipitation, the latter tending to be of high intensity. In attempting a flood control plan, it was necessary to consider the surrounding terrain, and to try to predict the nature of planned community development. Since much of the growth of the City is expected to take place in exactly those areas subject to serious flooding without proper planning, drainage design criteria were paramount in the recommendations. A 50-year storm frequency was selected as a base for the master plan consisting primarily of a combination of roadways, roadways with center channels, open channels, and retention lakes. Because of excessive costs involved, only limited use of underground drainage was projected. A grade ordinance plat was developed for the entire study areas to pemit housing construction at elevations above flood levels. The entire plan is projected for implementation in 4 phases at a total cost of fifteen million dollars, and details of work to be undertaken in each are given in a series of plates. (Paylore-Arizona)
W73-14476

WESTERN WHEATGRASS GERMINATION AS RELATED TO TEMPERATURE, LIGHT, AND MOISTURE STRESS,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
O. D. Knipe.
Journal of Range Management, Vol 26, No 1, p 68-69, January 1973. 1 fig, 1 tab, 1 ref.

Descriptors: *Wheatgrasses, *Light, *Temperature, *Germination, *Moisture stress, Soil stabilization, Rhizomes, Seeds, *New Mexico, Plant growth, Semiarid climates, Alkaline soils.
Identifiers: *Rio Puerco watershed (N Mex).

Western wheatgrass (Agropyron smithii Rydb.) was chosen for study to determine whether it could aid in soil stabilization in the badly depleted Rio Puerco watershed of west central New Mexico. Its qualities that make it suitable are that it is a rhizomatous long-lived perennial with high soil-stabilizing potential, it is adapted to alkaline soils, and its seedlings are vigorous and develop rapidly. Germination of western wheatgrass was best when seeds were held for 16 hr at temperatures between 55 and 75 degrees Fahrenheit, and 8 hr at temperatures between 75 and 90 degrees F daily. Germination was independent of light, but was severely reduced by moisture stresses above 1.0 atm. The detrimental effect of moisture stress was increasingly severe with increasing temperature above optimum. (Bahre-Arizona)
W73-14481

CHEMICAL COMPOSITION OF SIX SOUTHERN GREAT PLAINS GRASSES AS RELATED TO SEASON AND PRECIPITATION,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
E. E. Willard, and J. L. Schuster.
Journal of Range Management, Vol 26, No 1, p 37-38, Jan. 1973. 1 fig, 5 ref.

Descriptors: *Range grasses, *Chemical properties, *Seasonal, *Great Plains, *Precipitation (Atmospheric), Proteins, Ethers, Evaporation, Environmental effects, Plant growth substances, Moisture availability, Semiarid climates, Southwest U S, *Texas.
Identifiers: *Llano Estacado (Tex).

Grass samples collected from the Llano Estacado of Texas were analyzed to ascertain whether erratic rainfall affects the percentage of chemical fractions. The climate is typified by dry winters and by spring and late summer rainfall. High winds and high temperatures during the growing season result in high evaporation rates which reduce moisture available to plants. Seasonal influences caused variations in crude protein, ether extract, ash, crude fiber, and water. Nitrogen-free extract did not show a seasonal trend. Crude protein, crude fiber, and water content were directly influenced by the rainfall pattern during the growing season, but rainfall did not appear to significantly affect the other chemical components. (Bahre-Arizona)
W73-14482

OBION AND FORKED DEER RIVERS AND TRIBUTARIES, TENNESSEE AND KENTUCKY, INTERIM REPORT: HARRIS FORK CREEK.
Army Engineer District, Memphis, Tenn.

June, 1971. 38 p, 4 plates, 7 tab, photos, 6 append.

Descriptors: *Flood control, *Cost-benefit analysis, *Channel improvement, Flood protection, *Tennessee, *Kentucky, Flood plains, Flood damage, Cost-benefit ratio.
Identifiers: *Flood plain management, Harris Fork Creek (Tenn.), South Fulton Branch (Tenn.), Fulton (Tenn.), South Fulton (Tenn.), Obion River (Tenn.), Forked Deer River (Tenn.).

The District Engineer recommends that the West Tennessee Tributaries Project adopted by the Flood Control Act of 30 June 1948 be modified to include a project for flood control along Harris Fork Creek and its tributary, South Fulton Branch, at an estimated Federal cost of $2,813,000, to consist of channel pavement and enlargement. The study describes the authority under which investigations were made, prior reports completed, the natural characteristics of the study area, the area's flooding characteristics and problems, and existing flood control improvements of the Corps and other federal and nonfederal agencies. Based on this, alternative improvement plans are formulated with cost estimates and an economic analysis of each, noting benefits from flood damages prevented, increased utilization of lands, advanced bridge replacement, use of local unemployed labor, and others, to provide an estimate of average annual benefits. The selected plan is analyzed in greater depth in cost-benefit terms. Extensive appendices give technical data. (Edwards-North Carolina)
W73-14502

FUTURE ALLOCATIONS OF LAND AND WATER: IMPLICATIONS FOR AGRICULTURAL AND WATER POLICIES,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 06D.
W73-14521

ECONOMIC ASPECTS OF SLOPING LAND DRAINAGE,
Agricultural Research Service, Burlington, Vt. Water Conservation Research Div.
J. Bornstein, and C. L. Fife.
Journal of Soil and Water Conservation, Vol 18, No 2, p 76-79, 1973. 2 fig, 5 tab, 4 ref.

Descriptors: *Drainage practices, *Investment, *Return (Monetary), *Alfalfa, Diversion, Subsurface drainage, Vermont, Crop production, Forages, Installation costs, United States, Canada.
Identifiers: Cabot silt loam.

Effective drainage is an essential factor in the profitability of farming in the northeastern United States and eastern Canada. Alfalfa survival, hay yield, and composition data for seven years of record were employed to indicate response to three surface-subsurface drain treatments of four plots each. The plots were on Cabot silt loam which is a poorly drained, sloping fragipan soil. Although hay yields were not dramatically affected by drainage differences, alfalfa yields increased significantly as drainage intensity increased. Most dramatic was the effect of improved drainage on winterkill. Alfalfa survived severe winterkill conditions at rates of 31, 15, and 3% on subsurface drain spacings of 100- and 200-feet and no subdrains, respectively. Considering only yields and alfalfa quality the 200-foot subsurface system was more profitable. However, the 100-foot subdrain resulted in a much higher alfalfa survival during the 1966 winterkill. Thus, cost savings associated with reseeding should be compared with higher installation cost of the 100-foot subdrain and future prices predicted in order to determine the optimal long-term investment. (Weaver-Wisconsin)
W73-14523

U.S. DEEPWATER PORT STUDY. VOL. 1. SUMMARY AND CONCLUSIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-14524

ORIGINS AND ECOLOGY OF THE SIERRAN ALPINE FLORA AND VEGETATION,
New Hampshire Univ., Durham. Dept. of Botany.
Brian F. Chabot, and W. D. Billings.
Ecol. Monogr. 42 (2): 163-199. Illus. 1972.
Identifiers: *Alpine flora, Artemisia-Tridentata, *California, Chloroplasts, Ecology, Ephedra-Nevadensis, Light, Moisture, Pinus-spp., Reproduction, Respiration, Seasons, Sierran, Soils, Starch, Temperature, Tetradymia-Spinosa, Translocation, *Vegetation.

The primary study area was a transect from the desert near Bishop, California, (1400 m), to Piute Pass in the Sierra Nevada (3540 m). Upward along the transect the vegetational gradient is Ephedra nevadensis-Tetradymia spinosa desert shrub, Pinus monophylla-Artemisiatridentata open woodland, Pinus jeffreyi open forest, Pinus murrayana forest, Pinus albicaulis-sub-alpine herbaceous vegetation, and scattered alpine communities. Only 19% of the alpine species at Piute Pass occur in the Arctic, whereas 38% are held in common with the Rocky Mountains. Species endemic to the Sierra (17%) are in general predominantly from the Californian or Great Basin floras of lower elevations. A number of species have populations in the desert and also at high elevations near the alpine zone. Most of the alpine flora consists of perennials, but several annual species are also present. Annuals are rare in other arctic and alpine floras. Strong vegetation patterning occurs along drainageways from snowbanks or perrenial streams. Solar, sky, and net radiation at 1 m above the soil are greater for alpine than for desert areas. Air and plant-tissue temperatures near the surface of the alpine soil are higher than those in most other alpine areas. Germination of seeds from alpine plants occurred maximally between 20 and 30C. The low winter temperatures of the alpine zone appear to operate as an exogenous dormancy control. Temperatures of the upper photosynthetic compensation point and maximum net photosynthesis are lower in plants of alpine species. Acclimation of dark respiration appear related to changes in the rate of mitochondrial oxidation. Translocation of starch from chloroplasts at low temperatures was impaired in a desert species, but was maintained in a alpine species. There is no indication that any single process, or adaptation to temperature alone, is responsible for the evolution and success of an alpine species. Efficient utiliza-

tion of a short, cold growing season may be the most important selective characteristic in the origin of an alpine flora.--Copyright 1973, Biological Abstracts, Inc.
W73-14545

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1971-NOVEMBER 30, 1972,
Geological Survey, Washington, D.C.
J. V. B. Wells, and R. E. Fish.
June 1973. 82 p, 3 fig, 1 plate, 19 tab.

Descriptors: *Delaware River, *Hydrologic data, *Hydrologic budget, *Streamflow, *Water quality, Precipitation (Atmospheric), Runoff, Water yield, Floods, Reservoirs, Estuaries, Chemical analysis, Basic data collections, Hydrology, Water supply, Flow rates, Water temperature, Water utilization, Watershed management, Reservoir operation.

The River Master daily operation records were prepared by the Milford office of the Delaware River Master from basic data collected principally on a day-to-day basis by several agencies. The 1972 report year, December 1, 1971 to November 30, 1972, was a year of excessive precipitation and much above average runoff in the Delaware River basin. Severe floods associated with Tropical Storm Agnes occurred in the lower portion of the basin during June. The annual flow of Delaware River at Montague adjusted for change in reservoir storage and diversions was about 60% above median and the highest for the period of record beginning 1940. Pepacton, Cannonsville, and Neversink Reservoirs of the city of New York spilled during the spring and early summer. Diversions and releases from the reservoirs of the city of New York were made within the terms of the Amended Decree. Diversions by New Jersey through the Delaware and Raritan Canal were within prescribed limits of the Amended Decree. Precipitation on the basin above Montague for the 1972 report year was excessive, totaling 52.06 inches, which was the second highest for a report year in the period of record beginning December, 1940. (Woodard-USGS)
W73-14548

DECISIONS WITH INADEQUATE HYDROLOGIC DATA.
For primary bibliographic entry see Field 02A.
W73-14550

COMPUTATIONS OF PEAK FLOODS WITH INADEQUATE HYDROLOGIC DATA,
Columbia Univ., New York.
For primary bibliographic entry see Field 02A.
W73-14556

CONCEPT OF A TECHNIQUE FOR AN ANALYSIS OF WATERSHED RUNOFF EVENTS,
Agricultural Research Service, Riesel, Tex. Soil and Water Research Div.
For primary bibliographic entry see Field 02A.
W73-14559

ON THE USE OF SHORT-TERM DATA FOR STREAMFLOW SYNTHESIS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14563

A SIMILAR STORM METHOD ON FILLING DATA VOIDS,
Tokushima Univ., (Japan). Dept. of Engineering.
For primary bibliographic entry see Field 02A.
W73-14564

INADEQUATE HYDROLOGIC DATA AND RESERVOIR CAPACITY,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14567

EFFECTS OF INADEQUACE OF HYDROLOGIC DATA ON RELIABILITY OF WATER RESOURCES DESIGN,
Osaka Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14568

EVALUATION OF DROUGHT EFFECTS AT LAKE ATITLAN,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 02A.
W73-14569

THEORETICAL ANALYSIS OF THE ROLE OF SUBSURFACE FLOW IN THE GENERATION OF SURFACE RUNOFF: 2. UPSTREAM SOURCE AREAS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-14608

BASED ON THE EXAMPLE OF THE ZHDANOV PORT AREA (OPYT SPETSIALIZIROVANNOY KHARAKTERISTIKI GIDROLOGICHESKOGO REZHIMA NA PRIMERE RAYONA PORTA ZHDANOV),
State Oceanographic Inst., Moscow (USSR).
E. S. Karakash.
Available from the National Technical Information Service as AD-718 172, $3.00 in paper copy, $1.45 in microfiche. Naval Oceanographic Office, Washington, DC Report No. Trans-185, 1964. Trans. from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, Vol 34, p 5-72, 1957. 95 p, 21 fig, 49 tab, 26 ref, append.

Descriptors: Hydrologic aspects, *Ice cover, *Sea ice, *Harbors, Navigation, Coasts, Freezing, Hydrology, Seacoast, *Weather forecasting, Rivers, Winds, Sea level.
Identifiers: Ice breakup, *Zhdanov Port (USSR), *Ice forecasting, Ice thickness.

The hydrological regime in the northwestern part of Tanganrogskiy zaliv, where the Zhdanov Port with its channel system is located, is discussed from the point of view of navigation. Therefore the wind, waves, and ice phenomena in the area are analyzed, taking into consideration systematic observations carried out by hydrological and hydrometeorological stations in the area from 1945 to 1954, as well as by special expeditions organized in the area during the mentioned decade. On the basis of observation data special equations are composed, with the aid of which it is possible to calculate and forecast the average length of the navigational period, and the dates of various ice phases such as the first appearance of ice, freeze-up, breakup, and disappearance of ice, including variations in ice thickness, by months and by years. Also the occurrence of severe and mild winters and the effects of weather conditions in the region, as well as the peculiar coastal contours in the Zhdanov Port area and the influence of river discharges are analyzed in detail. (Sinha-OEIS)
W73-14632

OPTIMAL POLICY FOR RESERVOIR MANAGEMENT,
McGill Univ., Montreal (Quebec).
M. A. Muspratt.
Nordic Hydrology, Vol 4, No 2, p 57-76, 1973. 5 fig, 15 ref, 2 append.

Descriptors: *Reservoir operation, *Management, *Optimization, *Profit, Stochastic processes, Algorithms, Constraints, Economics, Water supply, Hydrologic cycle, Water users, Reservoir releases, Water loss, Seepage, Evaporation, Damsites, Mathematical models, Systems analysis, *Optimum development plans.
Identifiers: *Nonlinear programming, *Stochastic optimization.

The development of a rational management philosophy for existing reservoirs is being stimulated by the rapid exploitation throughout the world of dam sites which are economically and ecologically viable. A nonlinear, stochastic mathematical programming algorithm is used to maximize profit from the operation of a hypothetical reservoir over a finite time period. The problem is to manage the water released from the reservoir for domestic, industrial, irrigation, and low-flow augmentation uses so as to maximize the profit over the given period of time. Water may also be used for power generation, and losses are experienced due to seepage and evaporation. A transient hydrologic cycle is considered for the reservoir and its initial stored-water volume. The approach used to solve the problem is the sequential, unconstrained minimization technique (S.U.M.T.). S.U.M.T. is a stable and rapidly convergent method for optimization of nonlinear systems in which both the objective and the constraints are continuously twice differentiable (analytically or numerically). Further extensions to the proposed stochastic optimization procedure are described in Appendix A. (Bell-Cornell)
W73-14666

THE NATURAL VEGETATION OF THE SOUTHEAST SPANISH DRY AREA,
Goettingen Univ. (West Germany). Systematisch-Geobotanisches Institut.
H. Freitag.
Bot Jahrb Syst Pflanzengesch Pflanzengeogr, Vol 91, No 2/3, p 147-308, 1971, Illus, Map.
Identifiers: Climates, Cutting, Dry areas, Grazing, Mining, Succession, *Vegetation, *Spain.

A coastal belt about 300 km in length and 20-40 km in width, located in the provinces of Alicante, Murcia and Almeria was studied. Except in the mountain ranges the annual mean precipitation is less than 400 mm, in large tracts less than 300 mm, and drops down to 128 mm at Cabo de Gata. The vegetation has been heavily influenced by man. Mining (Ag) which resulted in a high demand for fuel for smelting processes; grazing; cutting of timber, fire- and brush-wood; and exploitation of fiber plants (Stipa tenacissima) led to extensive destruction of the natural vegetation and to the 'steppic' character of the area. Five plant communities with zonal distribution were recognized as the essential components of the natural vegetation: Quercetum rotundifoliae; Rhamno-Quercetum cocciferae; Querco-Lentiscetum; Asparago-Rhamnetum; Gymnosporio-Periplocetum. Detailed descriptions of the structure and floristic composition of these plant communities are given.--Copyright 1972, Biological Abstracts, Inc.
W73-14677

HYDROLOGIC SIMULATION.
Lake County Regional Planning Commission, Waukegan, Ill.

Prepared for Northeastern Illinois Planning Commission, Chicago. September 1971. 6 p, 2 fig. HUD 701 grant.

Descriptors: *Flood forecasting, *Land use, *Hydrologic models, *Simulation analysis, Statistical methods, Flood plains, Flood data, Flood recurrence interval, Flood stages, Computer models, *Illinois, Urbanization.

Identifiers: *Flood plain management, Impervious land cover, Impervious surfaces, Chicago River, *Lake County (Ill).

A synopsis of two reports on a hydrologic simulation model for the watershed of the North Branch of the Chicago River by Hydrocomp International is presented. The simulation model is used to help correct for urban development in a hydrologic data series to be used in statistical analyses. Various physical processes such as runoff, snow melting, and infiltration plus parameters including the amount of impervious land cover are incorporated into the model. The simulation model in conjunction with statistical analysis can then predict flood stages and be used in flood mapping programs under various given levels of urbanization. The basic conclusion is that urban development can continue upstream without significantly increasing downstream flood stages if flood plain storage is preserved upstream. If flood plain storage is reduced upstream, the hydrologic regime will be entirely altered and the peak discharge for a 100-year flood could double or triple. Thus, upstream land use planning and control of flood plain areas is the key to flood control. However, detention basins and levees are also useful, particularly to protect existing urban development in flood prone areas. (Elfers-North Carolina)
W73-14685

PRESSURE TRANSIENT ANALYSIS OF NATURALLY FRACTURED RESERVOIRS WITH UNIFORM FRACTURE DISTRIBUTION,
Atlantic Richfield Co., Dallas, Tex.
For primary bibliographic entry see Field 08B.
W73-14708

WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES,
Parsons (Ralph M.) Co., Los Angeles, Calif.
G. E. Arnold.
Journal of the American Water Works Association, Vol 62, No 12, p. 750-753, December, 1970.

Descriptors: *Water supply, Water treatment, Water users, Water rates, Economics, Labor supply, Income, Design, Equipment, Technology, *Training.
Identifiers: *International development agencies, Population growth, Improved living conditions, *Developing countries.

The best and most important way to improve living conditions in developing countries is to provide safe water supplies. Certain adjustments must be made by a western engineer when planning and building in a developing country. The stage of development, funds available, and local conditions must be considered. Two basic principles that must be followed are simplicity and economy. It is cheaper and more dependable in most cases, due to the unskilled manpower available, to employ more people rather than install automatic equipment. The engineering design work on these projects should be done in the project country, using local personnel wherever possible. In most cases AWWA standards will be acceptable. In setting water rates it is imperative that treated water be made available at an affordable price or the use of untreated water will continue; therefore, in many cases a reverse payment scale, charging large users more per unit than small users is a common practive. The training of operators is one of the most important phases of development and is usually part of the consulting engineer's contract. Operating and maintenance personnel are trained on site starting during the construction phase. Supervisory and management personnel are schooled at various locations such as the Public Health College of the University of North Carolina. Case studies of several recent projects are presented. (Smith-NWWA)
W73-14716

EFFECT OF CLEARCUTTING A BLACK SPRUCE BOG ON NET RADIATION,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
For primary bibliographic entry see Field 02D.
W73-14736

PREDICTION OF SITE INDEX OF LODGEPOLE PINE FROM SELECTED ENVIRONMENTAL FACTORS,
Colorado State Univ., Fort Collins. Dept. of Forest Science.
For primary bibliographic entry see Field 02I.
W73-14740

4B. Groundwater Management

RENOVATING SEWAGE EFFLUENT BY GROUNDWATER RECHARGE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 05D.
W73-14225

REPORT ON MAKEUP WATER FOR THE UPPER CANYON LAKES, LUBBOCK, TEXAS.
Freese, Nichols and Endress, Fort Worth, Tex.
For primary bibliographic entry see Field 05G.
W73-14236

MATHEMATICAL MANAGEMENT MODEL OF PARTS OF THE OGALLALA AQUIFER, TEXAS,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
F. A. Rayner, D. M. Wells, B. J. Claborn, D. D. Smith, and A. J. Sechrist.
Available from the National Technical Information Service as PB-223 557, $4.50 in paper copy, $1.45 in microfiche. Final Report, July 1973. 111 p, 27 fig, 9 tab, 12 plates, 52 ref. OWRR C-2101 (H3363) (2).

Descriptors: *Aquifer characteristics, Computers, *Permeability, *Storage coefficient, *Optimization, *Texas, Groundwater, Mathematical models.
Identifiers: *Ogallala Aquifer, Slaton channel (Tex), Parmer County (Tex), Steepest descent.

A digital computer procedure was developed for predicting to ultimate depletion a water table aquifer in which the configuration of the base of the aquifer becomes a controlling parameter. A portion of the 'Slaton Channel', a buried valley in the Ogallala Aquifer near Slaton, Texas, was selected for modeling. A rectangular system of nodes, with a small node spacing, was found to be most advantageous from the standpoints of ease of programming, use of CPU time, and computer core storage requirements. The large number of nodes resulting from the small node spacing made the Gauss-Seidel iteration method of solving systems of quadratic equations impractical. A parameter adjustment procedure was developed using the steepest descent optimization procedure for minimizing errors in simulated water levels. This procedure treated permeability and storage coefficients, as well as net withdrawals, as variables for purposes of determining simulated water levels. The model developed in Phase I of the project was applied to Parmer County, Texas, after the completion of a very comprehensive investigation and report on groundwater conditions in August, 1971. The results of this application indicate that the model is applicable to any area for which accurate net withdrawal rates in the future can be established. (Wells-Texas)
W73-14359

OPTIMAL IDENTIFICATION OF AQUIFER PARAMETERS IN A DISTRIBUTE SYSTEM,
California Univ., Los Angeles. Dept. of Engineering.
For primary bibliographic entry see Field 02F.
W73-14375

IDENTIFICATION OF PARAMETERS IN FINITE LEAKY AQUIFER SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 02F.
W73-14376

SIMPLEST ORGANIC ACIDS IN GROUNDWATER OF THE LOWER VOLGA REGION (GENESIS AND POSSIBLE USE IN PROSPECTING FOR OIL) (NIZSHIYE ORGANICHESKIYE KISLOTY V PODZEMNYKH VODAKH NIZHNEGO POVOLZH'YA (GENESIS I VOZMOZHNOST' ISPOL'ZOVANIYA V NEFTEPOISKOVYKH TSELYAKH),
Nizhne-Volzhskii Nauchno-Issledovatelskii Institut Geologii Geofiziki, Saratov (USSR).
For primary bibliographic entry see Field 02K.
W73-14434

RIVERSIDE'S GROUND WATER PUMPING SYSTEM.
FMC Corp., Los Angeles, Calif. Peerless Pump Div.

Water and Sewage Works, Vol 120, No 4, p 100-101, May 1973.

Descriptors: *Pumped storage, *Groundwater availability, *Water wells, *Pumping, Water supply development, Water table, *California, Reservoir storage, Colorado River Compact, Metropolitan Water Dist. of So. Cal., municipal water, Subsurface waters, Water conveyance, Water distribution (Applied), River basins.
Identifiers: Santa Ana River basin (Calif), *Riverside (Calif).

Riverside, California, located in the Santa Ana River basin, obtains practically its entire water supply from local wells. This underground river carries a steady flow of water from the San Bernardino Mountains to the Pacific Ocean. The water table varies from year to year, depending on an average rainfall range of 5-15 inches, with an actual rise in the water table caused by heavy floods that inundated the area 2 years ago. Water is pumped from an average depth of 100 feet, aided enroute by booster pumps, to the City's 32-million gallon storage reservoir. These booster pump stations, located around the City, maintain adequate pressure to provide a steady flow of water at all times of the year, especially at higher elevations. Two percent of the water in the City's system comes from a connection with the Colorado River water distribution system and the Metropolitan Water District. Planning projections for the future indicate that Riverside's underground water resources will provide at least two-thirds of its needs. (Bahre-Arizona)
W73-14478

DETERMINATION OF SOME HYDROLOGICAL FACTORS WITH A WELL RECORDER,
Ain Shams Univ., Cairo (Egypt).
For primary bibliographic entry see Field 02A.
W73-14557

PROBLEMS OF GROUNDWATER USE AND CONSERVATION IN LITHUANIA (VOPROSY ISPOL'ZOVANIYA I OKHRANY PODZEMNYKH VOD YUZHNOY PRIBALTIKI).

Litovskiy Nauchno-Issledovatel'skiy Geologorazvedochnyy Institut Trudy, No 17, Vilnius, V. Juodkazis, editor, 1971. 156 p.

Descriptors: *Groundwater, *Water utilization, *Water conservation, Groundwater movement, Groundwater recharge, Groundwater mining,

Hydrogeology, Aquifers, Water storage, Water table, Water levels, Water level fluctuations, Drawdown, Withdrawal, Safe yield, Water wells, Well filters, Water pollution, Water quality, Water chemistry, Glacial sediments.
Identifiers: USSR, *Lithuania SSR, Estonia SSR, Paleogeography, Mineralization.

Groundwater occurrence, movement, and conservation in Lithuania were investigated in this collection of 13 papers published by the Lithuanian Scientific Research Institute of Geological Exploration. Problems relating to well hydraulics, artificial recharge, bacteriological contamination in aquifers, and chemical quality of groundwater are discussed, and estimates are given of maximum feasible withdrawal of groundwater for aquifers in a region of glacial sediments. (Josefson-USGS)
W73-14606

BETTER WATER FOR PEOPLE IN LAS VEGAS,
Las Vegas Valley Water District, Nev.
For primary bibliographic entry see Field 05G.
W73-14688

NEW APPROACHES TO WATER-RESOURCES INVESTIGATIONS IN UPSTATE NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02F.
W73-14709

SELECTED BIBLIOGRAPHY ON LABORATORY AND FIELD METHODS IN GROUND WATER HYDROLOGY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-14711

TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
Illinois State Geological Survey, Urbana.
K. Cartwright.
Circular No. 433, 1968. 41 p, 27 fig, 4 tab, 42 ref.

Descriptors: *Exploration, Prospecting, Geophysics, On-site investigations, Remote sensing, *Subsurface investigations, Water sources, Equations, Electronic equipment, Research equipment, *Aquifer characteristics, Thermal properties, *Specific heat, *Illinois.
Identifiers: Heat sink, Temperature anomaly, Electronic thermometer, Glacial Alluvial deposits, *Groundwater exploration.

Most geophysical techniques used in the exploration for ground water measure some property of the rocks, rather than properties of water. However, the presence of water in the rocks affects the results somewhat in electrical earth resistivity and seismic methods, the most commonly used exploration techniques. A property that may be exploited in ground-water exploration is the high specific heat of water or its resistance to changes in temperature. Theoretical considerations of glacial and alluvial deposits suggest that a saturated aquifer may disturb the geothermal gradient by acting as a heat sink (absorbing heat) (Lovering and Goode, 1963) or heat source. This disturbance may influence the surface soil temperature. If surface soil temperature variations resulting from disturbance of the geothermal gradient by a shallow aquifer can be measured, the presence of the aquifer might be detected. (Smith-NWWA)
W73-14714

FIBERGLASS PLASTIC CASING OVERCOMES CORROSION PROBLEM IN WATER WELLS IN WEST PAKISTAN,
Tepton and Kalmbach, Inc., Denver, Colo.
D. K. Smith.
Society of Mining Engineers, AIME, Transactions, Vol 244, No 1, p 24-28, March, 1969.

Descriptors: *Corrosion control, *Bacteria, *Water quality control, Water analysis, Materials, *Water wells, Bactericides, *Irrigation systems.
Identifiers: *Well rehabilitation, *Sulfate-reducing bacteria, Chlorine shock treatment, Incrustation, *Fiberglass plastic pipe, *Pakistan.

The Reclamation Program for the Northern Zone of the Indus Plains in West Pakistan involves the construction of 30,000 irrigation wells to serve 20 million acres with an annual pumpage of nearly 40 million acre-ft. Detailed hydrologic studies indicated that mild steel would be satisfactory for casing; however, within two years after construction, about 10% of the wells began to fail due to encrustation and corrosion of the casing. A search to find a noncorrosive substitute for the steel casing disclosed that only fiberglass-reinforced plastic pipe satisfied all requirements. The results of initial use of fiberglass have been highly satisfactory and have resulted in a lower over-all well cost. Advances in technology promise further reduction in prices and improvement in performance. (Smith-NWWA)
W73-14722

THE HORIZONTAL WELL AS A NEW METHOD OF RANGE WATER DEVELOPMENT,
Agricultural Research Service, Tucson, Ariz.
For primary bibliographic entry see Field 08B.
W73-14729

4C. Effects on Water of Man's Non-Water Activities

AN INTERDISCIPLINARY EVALUATION OF ERTS POTENTIAL FOR ARID REGIONS,
Nevada Univ., Reno. Renewable Resources Center.
For primary bibliographic entry see Field 07C.
W73-14344

GEOGRAPHIC INVESTIGATIONS ASSOCIATED WITH THE EROS PROGRAM OF THE DEPARTMENT OF THE INTERIOR,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 07B.
W73-14346

ENERGY BUDGET AND PHOTOSYNTHESIS OF CANOPY LEAVES,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 02I.
W73-14358

HIGH YIELD FROM THE BULL RUN WATERSHED,
British Columbia Dept. of Municipal Affairs, Victoria. Environmental Planning and Management Div.
For primary bibliographic entry see Field 02A.
W73-14687

4D. Watershed Protection

RUNOFF, EROSION, AND TILLAGE EFFICIENCY ON GRADED-FURROW AND TERRACED WATERSHEDS,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
C. W. Richardson.
Journal of Soil and Water Conservation, Vol 28, No 4, p 162-164, July-August 1973. 3 fig, 2 tab, 5 ref.

Descriptors: *Erosion control, *Terracing, *Water control, Rainfall-runoff relationships, Soil conservation, Contour furrows, Contour farming, Contours.
Identifiers: *Graded furrows.

Runoff, soil loss, and farm tillage efficiencies of a graded-furrow system were compared with those of a terrace system. Runoff was significantly less from the graded-furrow area than from the terraced area, and erosion from the two areas was essentially equal. Tillage rates were about 21 percent faster on the graded-furrow area than on the terraced area. The graded-furrow system functioned well during an intense storm that caused terrace failure on many adjacent areas. (Knapp-USGS)
W73-14410

WATER YIELD AND EROSION RESPONSE TO LAND MANAGEMENT,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
R. G. Spomer, K. E. Saxton, and H. G. Heinemann.
Journal of Soil and Water Conservation, Vol 28, No 4, p 168-171, July-August 1973. 3 fig, 3 tab, 7 ref.

Descriptors: *Water yield, *Sediment yield, *Erosion control, *Terracing, *Contour farming, Contours, Loess, Land management, Contour furrows, Iowa, Topography, Rainfall-runoff relationships.

Nearly equal water yields on level-terraced corn and contoured-corn watersheds were found in 8 years' observation of five research watersheds. Water yield from a grassed watershed was 37 percent less. Surface runoff was 10 percent of water yield from the terraced watershed and 65 percent of water yield from the contoured watersheds. Peak runoff rates from terraced-corn and grassed watersheds were 10 percent of those from contoured-corn watersheds. Sheet erosion averaged 24 tons per acre per year on the contoured-corn watersheds and less than 1 ton per acre per year from the terraced-corn watersheds. Gully erosion averaged 450 tons per year from the contoured-corn watershed, but was negligible on the terraced and grassed watersheds. (Knapp-USGS)
W73-14411

INFILTRATION, HYDRAULIC CONDUCTIVITY, AND RESISTANCE TO WATER-DROP IMPACT OF CLOD BEDS AS AFFECTED BY CHEMICAL TREATMENT,
Iowa State Univ., Ames. Dept. of Soil Science.
D. M. Gabriels, W. C. Moldenhauer, and D. Kirkham.
Soil Science Society of America Proceedings, Vol 37, No 4, p 634-637, July-August 1973. 4 tab, 15 ref.

Descriptors: *Infiltration, *Soil erosion, *Impact (Rainfall), *Erosion control, *Soil treatment, Soil structure, Soil sealants, Soil stability, Water proofing, Wetting, Wettability.
Identifiers: Soil conditioners.

To test the effectiveness of surface treatments in preventing erosion during rainfall, chemicals and bitumen were sprayed on large dry surface clods (8 to 20 mm) and small surface clods (2 to 8 mm) of a Clarion loam. The small clods were initially wetted with 15% water on a soil weight basis and mixed with bitumen emulsions. The large and small clods were subjected to a 6.35-cm-per-hour simulated rainfall. Simultaneously with the measurements of infiltration rate, determinations were made of the starting time for initial runoff, energy needed to initiate runoff, runoff rate, total soil loss, and final

soil loss rate. Most of the soil conditioners on large clods kept the infiltration rate high and prevented runoff on a 9% slope. Polyvinyl alcohol and polyacrylamide prevented any soil loss during 90 min. Surface applications with bitumen emulsions were also highly effective in preventing erosion of large clods but were less effective for small clods. When the bitumen emulsions were mixed with the small clods, the saturated hydraulic conductivity was very high. The infiltration rate was low because water would not enter the clod bed and stable clods were carried in the runoff water. (Knapp-USGS)
W73-14413

MIDDLETOWN STREAMBELT REPORT.
Soil Conservation Service, Washington, D.C.

Prepared for the Town of Middletown, Connecticut, published by Eastern Connecticut Resource Conservation and Development Project, March 1973. 25 p, 2 tab, 1 map, append.

Descriptors: *Streambeds, *Conservation streams, Banks, Connecticut.
Identifiers: *Streambelts, *Middletown (Conn), Mattabesset River (Conn), *Connecticut River basin.

The city of Middletown is divided into twenty-three watershed areas. Within the watersheds, streambelts are identified, along with major potential water development sites and other significant features. A streambelt is a corridor which includes a watercourse, floodplains, lakes and ponds associated with the stream, potential water development sites of public significance, areas in proximity to streams where certain potential land uses would have probable adverse environmental effects, and contiguous lands with special beneficial and environmental values. The study is one phase of inventorying natural resources of the city. It is the result of field reconnaissance and map studies. There is evidence of streambelt encroachment by development. Eleven conditions are identified in which streambelt protection serves the public interest. Among these are protection of areas of vital importance in the preservation of significant ecological systems; retention of potential impoundment sites for beneficial water uses such as flood control, water supply, wildlife habitat, and recreation; protection of water quality and high yielding ground water areas that are important to water supply; maintaining a framework of environmental corridors of high quality with close proximity to neighborhood and population centers. (Stein-North Carolina)
W73-14484

SOIL EROSION--THE UNMENTIONED POLLUTER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02J.
W73-14720

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

SELECTED PESTICIDES IN AQUATIC FUNGI IN THE THREE RIVERS AREA,
Michigan State Univ., East Lansing. Dept. of Botany.
E. S. Beneke, and K. L. O'Donnell.
Available from the National Technical Information Service as PB-223 372, $3.00 in paper copy, $1.45 in microfiche. Institute of Water Research, Michigan State University, Project Completion Report, August 1973. 16 p, 10 fig, 3 tab, 16 ref. OWRR A-057-MICH (1). 14-31-0001-3522.

Descriptors: *DDT, Dieldrin, Ambient light, *Aquatic fungi, Metabolism, *Pesticide residues, *Michigan, Protozoa, Monitoring, Pollutant identification.
Identifiers: *Saprolegniaceous fungi, Ciliated protozoan, Fungal inocula, Protozoan inocula, DDT monitors, *Gas-liquid chromatography, Metabolites, Red Cedar River (Mich), Au Sable River (Mich).

This study involved the collection and identification of saprolegniaceous fungi in the Red Cedar and Au Sable Rivers. The most common species were studied in the laboratory and in the Red Cedar River to determine their ability to uptake and metabolize DDT. The value of these aquatic fungi as pesticide monitors was also investigated. In addition, the transfer of DDT from aquatic fungi to a ciliated protozoan was studied. No discernible correlation exists between pollution aspects of the habitat and species occurrence of the saprolegniaceous fungi in the Red Cedar and Au Sable Rivers. However, the use of special baits and extensive sampling may yield a technique of greater sensitivity. Dictyuchus monosporus was the most abundant saprolegniaceous species collected during the sampling periods in the Red Cedar and Au Sable Rivers. The use of twigs, leaves, and bottom sediment appears to be a more effective method for the isolation of these aquatic fungi than the aluminum tea ball method. The four species of aquatic fungi studied, Dictyuchus monosporus, Saprolegnia parasitica, Achlya americana, Aphanomyces sp., were able to concentrate DDT at levels much higher (37.5 to 135 fold within the first 24 hours) than the ambient concentrations in the nutrient media. In addition, Saprolegnia parasitica was able to concentrate DDT by 6.75 fold in soil amended with this pesticide. Tetrahymena pyriformis was able to concentrate this pesiticide by 12 fold over the ambient concentration in the nutrient medium.
W73-14207

AN ASSESSMENT OF AUTOMATIC SEWER FLOW SAMPLERS,
Hydrospace-Challenger, Inc., Rockville, Md.
P. E. Shelley, and G. A. Kirkpatrick.
Copy available from GPO Sup Doc as EP1.23/2:73-261, $2.60; microfiche from NTIS as PB-223 355, $1.45. Environmental Protection Agency Technology Series Report EPA-R2-73-261, June 1973. 233 p, 23 fig, 4 tab, 29 ref. EPA Contract 68-03-0155.

Descriptors: Automatic control, Pollutants, Hydraulics, *Sampling, Antomation, *Flow measurement, Instrumentation, Sewers, *Storm drains, Storm runoff, Measurement, Water sampling, Design flow, *Reviews.
Identifiers: *Combined sewer flows, *Automatic samplers.

A brief review of the characteristics of storm and combined sewer flows is followed by a general discussion of the purposes for and requirements of a sampling program. The desirable characteristics of automatic sampling equipment are set forth and problem areas are outlined. A compendium of over 60 models of commercially available and custom designed automatic samplers is given with descriptions and characterizations of each unit presented along with an evaluation of its suitability for a storm and/or combined sewer application. A review of field experience with automatic sampling equipment covering problems encountered and lessons learned. A technical assessment of the state-of-the-art in automatic sampler technology, and design guides for development of a new, improved automatic sampler for use in storm and combined sewers are presented. (EPA)
W73-14221

ATOMIC ABSORPTION ANALYSIS OF PHOSPHATES IN WATER,
Wisconsin Univ., Milwaukee. Dept. of Chemistry.
C. O. Huber.
Available from the National Technical Information Service as PB-223 338, $4.50 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report EPA-670/2-73-079, October 1973. 35 p, 3 fig, 7 tab, 7 ref. EPA Project 16020 DHD

Descriptors: Absorption, *Phosphates, Water analysis, *Sulfates, *Silicates, *Pollutant identification.
Identifiers: *Inhibition titration, *Atomic absorption analysis.

The project investigated utilization of phosphate, silicate, and sulfate chemical inhibition effects in magnesium atomic absorption spectrometry for the purpose of determination of these anions. The variables found to be of greatest significance in the inhibition processes were flame temperature and solution stoichiometry. The procedure termed 'atomic absorption inhibition titration' (AAIT) was developed. It provides useful, new determination methods for single anions and also for simultaneous determination of phosphate, silicate, and sulfate in a single sample. The methods have been evaluated and applied to water and waste water samples. (Booth-EPA)
W73-14223

APPLICATION OF OXINE IN THE POLAROGRAPHIC ANALYSIS OF ORGANOMETALLIC COMPOUNDS. MICRODETERMINATION OF CADMIUM, MAGNESIUM, ZINC, MANGANESE, AND COBALT,
Institut National des Sciences et Techniques Nucleaires, Saclay (France).
S. W. Bishara.
Mikrochimica Acta, No 1, p 25-32, 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Cadmium, *Magnesium, *Zinc, *Manganese, *Cobalt, *Polarographic analysis, Heavy metals, Chemical analysis, Alkaline earth metals, Hydrogen ion concentration, Chemical reactions, Chemical precipitation.
Identifiers: *Organometallics, Oxine, Accuracy, Errors.

A procedure for the microdetermination of Cd, Mg, Zn, Mn, and Co in organometallic compounds is presented. After closed-flask combustion, the metal-oxine complex is precipitated from an ammonia-ammonium chloride buffered medium of pH 10. At this pH value oxine gives a well-defined polarographic wave. The wave height of an excessive volume of oxine is measured before and after it has been used to precipitate a known weight of the organometallic compound. The method is simple and rapid; one determination consumes 25 minutes. The average percent error amounts to plus or minus 0.53. (Holoman-Battelle)
W73-14244

SEPARATION OF MOLYBDENUM FROM TUNGSTEN, VANADIUM, IRON, URANIUM AND SEVERAL OTHER INTERFERING ELEMENTS BY EXTRACTION OF ITS THIOSULPHATO COMPLEX,
Kurukshetra Univ. (India). Dept. of Chemistry.
V. Yatirajam, and J. Ram.
Mikrochimica Acta, No 1, p 77-86, 1973. 5 tab, 10 ref.

Descriptors: *Separation techniques, *Molybdenum, *Solvent extractions, Methodology, *Pollutant identification, Heavy metals, Iron, Titanium, Chromium, Manganese, Cobalt, Nickel, Aluminum, Chemical reactions, Color reactions.
Identifiers: *Metal complexes, *Metal-thiosulphato complexes, Vanadium, Tungsten, Zirconium, Cerium, Uranium, Bismuth, Antimony, Chemical interference.

A sample solution containing 0.8 mg or less Mo/ml, 1.5 N HCl and 32 mg Na2S203.5H20/ml, is shaken with methyl isobutyl ketone at about 10 degrees. Molybdenum is stripped off the solvent

th ammonia-hydrogen peroxide solution and is termined after the filtration of any insoluble droxides and decomposition of hydrogen perox- and any polythionates. The procedure parates microgram to mg of molybdenum from ge amounts of Ti (IV), V (V), Cr (VI), Mn (II), (III), Co (II), Ni (II), W (VI), Zr (IV), Ce (IV), (VI), Bi (V), Sb (III) and Al (III) in a wide riety of samples. (Holoman-Battelle)
73-14246

ICRO AND SEMIMICRO DETERMINATION ARSENATE USING ION-SELECTIVE ELEC-RODES,
lifornia Univ., Livermore. Lawrence Liver-re Lab.
Selig.
krochimica Acta, No 3, p 349-359, 1973. 3 fig, 4 , 25 ref.

escriptors: *Methodology, *Pollutant identifica-n, Analytical techniques.
entifiers: *Ion selective electrodes, *Arsenates, tentiometric titration, Fluoride electrodes, Lead ectrodes.

n indirect method for the microestimation of 0.75 15 ppm (0.01-0.2 mM) of As (V) has been scribed: Arsenate is precipitated with nthanum nitrate at a pH of 8.65. The excess of nthanum is titrated with standard fluoride, using fluoride ion-selective electrode. Equivalence ints are located on volume-corrected Gran's ot paper. This method can also be used to esti-ate the sum of arsenate and phosphate. For rger amounts of arsenate and for increased preci-on and accuracy, potentiometric titration with ad perchlorate, using a lead ion-selective elec-ode, is recommended. Other possibilities for termining arsenate and a method for estimating ngstate are suggested. (Holoman-Battelle)
73-14250

PECTROPHOTOMETRIC DETERMINATION F CALCIUM,
pper Iowa Univ., Fayette.
or primary bibliographic entry see Field 02K.
73-14251

OME LIMNOLOGICAL CHARACTERISTICS F THE NOZHA HYDRODROME, NEAR LEXANDRIA, EGYPT,
lexandria, Univ. (Egypt). Dept. of Oceanog-phy.
. A. H. Saad.
ydrobiologia, Vol 41, No 4, p 477-499, May 30, 73. 3 fig, 6 tab, 47 ref.

escriptors: *Limnology, *Water chemistry, *Ar-ficial lakes, *Physicochemical properties, Water quality, Water sampling, Water analysis, hemical analysis, Physical properties, Chemical roperties, Secchi disks, Light penetration, ydrogen ion concentration, Bottom sampling, issolved oxygen, Chlorides, Water temperature, Vater levels, Air temperature, Suspended solids, issolved solids, Africa, Pollutant identification.
dentifiers: *Nozha Hydrodome, Seasonal varia-on, *Egypt, Chlorosity, Total residue.

ertain limnological characteristics of Nozha lydrodome, an Egyptian artificial lake, have been tudied and the data obtained compared with those rom the same lake prior to the erection of the high am south of Aswan. Water samples were col-ected monthly during a 1-yr period for the deter-ination of pH, chlorosity, dissolved oxygen and otal residue of the lake water. Light penetration nd water temperature were measured at each ampling site. Variations of water level, Secchi isc readings, pH, chlorosity, and total residue are orrelated with the introduction of a large amount f fresh Nile water into the lake, to replace that ost mainly by evaporation. Comparison with the previous data, gave considerable changes. (Holoman-Battelle)
W73-14252

ON THE VARIABILITY OF STEPHANODISCUS HANTZSCHII GRUN., (UBER DIE VARIABILITAT VON STEPHANODISCUS HANTZSCHII GRUN),
Rostock Univ. (East Germany). Institut fuer Hygiene.
L. Kalbe.
Hydrobiologia, Vol 42, No 1, p 21-29, July 6, 1973. 5 fig, 19 ref.

Descriptors: *Systematics, *Diatoms, *Ecology, Benthic flora, Phytoplankton.
Identifiers: *Stephanodiscus hantzschii var. pusillus, *Stephanodiscus hantzschii var. striatior, Warmow River, Malchiner Peene River, Neukalener Peene River, Lake Kummerow, *Germany.

A new variety, striatior, of the diatom Stephanodiscus hantzschii GRUN. (S. h.) with denser striae was described (Kalbe 1971). The validity of S.h. var. pusillus is confirmed by specimens from freshwaters of the north of Mecklenburg. The species S.h. probably consists in this region of several races with different peaks of valve diameter variation. The planktonic mass changing of S.h. and its forms in the three rivers Warnow, Malchiner Peene and Neukalener Peene and in the Lake Kummerow is represented. The differences of the average valve sizes in these waters are remarkable. Var. pusillus GRUN. appears to be a benthic mass form, too. High cell numbers and high cell volume sums are not developing ever simultaneously. Var. pusillus is not a suitable form for evaluating the saprobiological status, for it is adaptable to different ecological conditions. The species S.h. itself is a beta- to alphamesosaprobic organism, being able to produce high cell numbers within this range of saprobity. (Little-Battelle)
W73-14254

THE EPIPHYTIC DIATOM FLORA OF THE BENTHIC MACROPHYTE COMMUNITIES ON ROCKY SHORES IN THE SOUTHWESTERN ARCHIPELAGO OF FINLAND, SEILI ISLANDS,
Turku Univ. (Finland). Dept. of Botany.
H. Rautiainen, and O. Ravanko.
Nova Hedwigia, Vol 23, No 4, p 827-842, 1972. 8 fig, 15 ref.

Descriptors: *Diatoms, *Marine algae, *Biological communities, Marine plants, Speciation, Systematics, Pondweeds, Chlorophyta, Chrysophyta, Phaeophyta, Rhodophyta, Intertidal areas, Benthic flora, Cyanophyta, Epiphytology, Water sampling, Classification, Statistical methods, Kelps.
Identifiers: *Epiphytes, *Macrophytes, Sample preparation, Finland, Seili Islands, Gyrosigma, Licmophora, Rhizosolenia, Surirella gemma, Surirella ovata, Surirella striatula, Potamogeton spp, Cladophora glomerata, Fucus vesiculosus, Pilayella littoralis, Ceramium tenuicorne, Calothrix scopulorum, Achnanthes spp.

An analysis of the epiphytic diatom flora was carried out in connection with a study of the benthic macrophyte communities in the SW archipelago of Finland, Seili Islands (Ravanko, 1972). Samples were taken from macrophytes collected from quadrats (1 sq m) on 13 lines. Preparations were made by pulverizing and homogenizing the macrophyte material to which was then added strong hydrogen peroxide. This mixture was allowed to stand 2-3 days at room temperature or 2 days at 40-50C to allow the digestion of organic matter. Test tubes containing the mixture were then centrifuged and the material transferred to a cover glass, dried, and mounted in Clearax for microscopic observations. The diatoms were determined and counted; results relating to the same macrophyte belt were combined. The percentages of each diatom species in the different belts were calculated. The occurrence in the macrophyte belts of diatoms with percentages of five or more is presented in diagrams. No clear zonation of diatoms was distinguished corresponding to the macrophyte belts, but statistical analysis showed that on most lines the macrophyte belts differed from each other in regard to their epiphytic diatom flora. The species composition of the epiphytic diatom flora is discussed and compared with that of other areas. (Holoman-Battelle)
W73-14256

EFFECTS OF POLLUTION ON FRESHWATER FISH,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 05C.
W73-14259

MICROBIOLOGY OF WATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 05B.
W73-14260

MICROBIOLOGY-DETECTION OF BACTERIAL PATHOGENS AND THEIR OCCURRENCE,
National Environmental Research Center, Cincinnati, Ohio.
D. J. Reasoner.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1278-1289, June 1973. 105 ref.

Descriptors: *Pathogenic bacteria, Distribution, *Pollutant identification, *Water pollution sources, Water pollution effects, Pollutants, *Isolation, Methodology, *Bibliographies, *Reviews, *Microbiology, Aerobic bacteria, Anaerobic bacteria, Enteric bacteria, Human diseases, Public health, Coliforms, Zoonoses, Domestic wastes, Waste water (Pollution), Animal diseases, Epidemiology, Epizootiology, Wildlife, Laboratory animals, Animal wastes (Wildlife), Solid wastes.
Identifiers: Enumeration, Serotypes, Recovery, Culture media, Culturing techniques, Enrichment, Biological samples, Environmental samples, Edwardsiella tarda, Sallmonella newington, Salmonella montevideo, Salmonella typhimurium, Salmonella enteritidis, Salmonella anatum, Salmonella derby, Salmonella dublin, Slaughterhouse wastes, Feces, Salmonella aberdeen, Samonella choleraesuis, Slmonella bovis-morbificans, Enterobacteriaceae.

This literature review is concerned with the occurrence of various pathogenic bacteria along with methods for detecting such organisms. (Holoman-Battelle)
W73-14263

MICROBIOLOGY-DETECTION AND OCCURRENCE OF VIRUSES,
National Environmental Research Center, Cincinnati, Ohio.
G. Berg.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1289-1294, June 1973. 45 ref.

Descriptors: *Viruses, *Pollutant identification, *Shellfish, Methodology, *Bibliography, Waste water (Pollution), Water pollution, *Public health, Distribution, *Reviews, Pollutants, Swimming pools, Water wells, Natural streams, Human diseases, Epidemics, Aquatic environment, Estuarine environment, Equipment, *Microbiology, Saline water, Permselective membranes, Bacteriophage, Polyelectrolytes, Oysters, Clams, Potable water, Electro-osmosis, Adsorption, Mussels, Flocculation, Chemical precipitation, Hospitals, Reverse osmosis, E. coli, Water pollution effects, Epidemiology, Path of pollutants.

Identifiers: Recovery, Marine environment, Membrane filters, Enteroviruses, Poliovirus 1, Poliovirus 2, Ultrafiltration, Adenoviruses, Cellulose acetate, Coxsockie virus B5, Cellulose nitrate, Coliphage T2, Reovirus 1, Echovirus 7, Echovirus 11, Echovirus 1, Echovirus 6, Echovirus 12, Echovirus 14, Echovirus 19, Echovirus 20, Coxsackie virus B1, Coxsackie virus B3, Coxsackie B4, Tissue cultures, Crassostrea virginica, Pachygraspus, Mytilus californianus, Hemigraspus, Coliphage T4, Cancer magister, Cancer antennarius, Infectious hepatitis, Distilled water.

This literature review is concerned with the occurence and methods of detecting virus in polluted water and organisms. (Holoman-Battelle)
W73-14264

VERSATILE COMBUSTION-AMALGAMATION TECHNIQUE FOR THE PHOTOMETRIC DETERMINATION OF MERCURY IN FISH AND ENVIRONMENTAL SAMPLES,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
W. A. Willford, R. J. Hesselberg, and H. L. Bergman.
Journal of the Association of Official Analytical Chemists, Vol 56, No 4, p 1008-1014, July 1973. 3 fig, 3 tab, 16 ref.

Descriptors: *Mercury, *Chemical analysis, Fish, *Methodology, *Pollutant identification, Plant tissues, Sediments, Photometry, Water analysis, Soil analysis, Lake sediments, Heavy metals, Coho salmon, Lake Michigan, Coals, Aquatic plants.
Identifiers: *Environmental samples, *Biological samples, Chemical interference, Detection limits, Precision, Sensitivity, Accuracy, Sample size, Sample preparation, Chemical recovery, Amalgamation, Animal tissues, Reproducibility, Chara, Muscle.

Total mercury in a variety of substances is determined rapidly and precisely by direct sample combustion, collection of released mercury by amalgamation, and photometric measurement of mercury volatilized from the heated amalgam. Up to 0.2 g fish tissue is heated in a stream of 02 (1.2 1/min) for 3.5 min in 1 tube of a 2-tube induction furnace. The released mercury vapor and combustion products are carried by the stream of 02 through a series of traps (6 percent NaOH scrubber, water condenser, and Mg (C104)2 drying tube) and the mercury is collected in a 10 mm diameter column of 24 gauge gold wire (8 g) cut into 3 mm lengths. The resulting amalgam is heated in the second tube of the induction furnace and the volatilized mercury is measured with a mercury vapor meter equipped with a recorder-integrator. Total analysis time is approximately 8 min/sample. The detection limit is less than 0.002 microgram and the system is easily converted for use with other biological materials, water, and sediments. Major advantages of the method include: simplicity of operation; speed of complete analysis; high sensitivity, precision, and accuracy; small sample size required; freedom from rigorous and sometimes hazardous acid-digestion procedures; freedom from reagent and glassware contamination; and comparatively low cost of equipment. Disadvantages of the method include: somewhat limited usable range of sensitivity (0.02-5.0 ppm); a general inability to analyze highly contaminated samples (greater than 5.0 ppm) without the use of a gas stream splitter or an extremely small sample; necessity for frequent changes in attenuation of mercury vapor meter, unless previous knowledge permits grouping of samples within ranges having less than a 5-fold difference inconcentration; and increased emphasis on the need for well homogenized representative samples. Minor changes in the system or substitution of a less sensitive mercury vapor meter would overcome many of these disadvantages when they are restrictive for a particular use. (Holoman-Battelle)
W73-14271

RETENTION OF MERCURY WHEN FREEZE-DRYING BIOLOGICAL MATERIALS,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
P. D. LaFleur.
Analytical Chemistry, Vol 45, No 8, p 1534-1536, July 1973. 5 tab, 6 ref.

Descriptors: *Mercury, *Radioactivity techniques, Aqueous solutions, Heavy metals
Identifiers: *Biological samples, *Freeze drying, *Feces, Methylmercuric chloride, Sample preparation, Phenylmercuric acetate, Chemical recovery, Precision, Tissue, Muscle, Blood, Liver, Brain, Kidneys, Heart, Organomercury compounds, Methylmercury, Lyophilization.

Guinea pigs and rats were fed foods containing Hg-203 labelled phenylmercuric acetate, methylmercury chloride, or inorganic mercury for use in tests to determine whether mercury losses occur during lyophilization (freeze drying) of biological samples. Upon sacrifice, the animals were dissected, and the liver, kidney, heart, brain, muscle, spleen and samples of blood taken for study. Feces were also collected during the feeding regimen. The samples were weighed, the relative mercury content determined radiometrically, and frozen. The samples were then lyophilized and the mercury content was again determined radiometrically. Net loss of mercury was calculated after making appropriate decay corrections. Of a total of over 30 tissue samples from animals fed methylmercury chloride, the mean mercury loss was less than 3 percent. Of the 10 organ samples from animals fed inorganic mercury and 11 tissue samples from those fed phenylmercuric acetate, the mean loss was less than 2 percent. Loss from blood was negligible, loss from feces was approximately 10 percent. Additional tests to determine the effects of pretreatment by freezing and time of lyophilization showed that neither affected loss of mercury. Freeze drying of aqueous solutions resulted in losses up to 90 percent for the organomercurials and 10 percent for inorganic mercury. (Little-Battelle)
W73-14272

COLLABORATIVE STUDY OF THE RECOVERY AND GAS CHROMATOGRAPHIC QUANTITATION OF POLYCHLORINATED BIPHENYLS IN CHICKEN FAT AND POLYCHLORINATED BIPHENYL-DDT COMBINATIONS IN FISH,
Food and Drug Administration, Minneapolis, Minn.
L. D. Sawyer.
Journal of the Association of Official Analytical Chemists, Vol 56, No 4, p 1015-1023, July 1973. 6 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Poultry, *Fish, *DDT, *Chemical analysis, Chlorinated hydrocarbon pesticides, Methodology, DDE, DDD, Pesticide residues.
Identifiers: Animal tissues, *Electron capture gas chromatography, Chemical recovery, *Fat tissue, Quantitative analysis, Interlaboratory studies, Isomers, Aroclor 1260, Aroclor 1254, Aroclor 1242, Gas liquid chromatography, Collaboratove studies, Precision, Animal fat, Sample preparation, p p' DDE, p p' TDE, p p' DDT, o p' DDT, Biological samples.

Nine laboratories collaborated on the analyses of PCBs in chicken fat and DDT-PCB combinations in fish. Existing AOAC multipesticide methodology with GLC quantitation was employed. One solution containing a mixture of Aroclors 1254 and 1260 was analyzed by GLC only. The fish samples were subjected to a published silicic acid procedure for separating the DDT-PCB mixtures. The DDT analogs were quantitated before and after the separation. The PCB content was quantitated by total peak height and total area comparisons against appropriate Aroclor (s) , using electron capture GLC, and additionally in 6 laboratories by total area comparisons, using halogen-specific detection. The electron capture GLC data demonstrated better accuracy and precision. The following PCB recoveries were obtained by using total peak height comparisons: 5 ppm mixed Aroclor solution, 100 plus or minus 4 percent; 8 ppm Aroclor 1242-fortified chicken fat, 101 plus 13 percent; 7.5 ppm Aroclor 1248-fortified chicken fat, 96 plus or minus 9 percent, incurred Aroclor 1242 chicken fat, 9.2 ppm plus or minus 8 percent; 6 ppm Aroclor 1254-fortified fish, 75 plus or minus 14 percent; 6 ppm Aroclor 1260-fortified fish, 75 plus or minus 15 percent; and an environmentally incurred residue in fish, 4.5 ppm plus or minus 20 percent. The 2 Aroclor-fortified fish samples were concurrently spiked with the p,p'-isomers of DDE, TDE, and DDT at levels of 4, 1, and 3 ppm, respectively. After silicic acid separation the combined recoveries for these 2 samples were DDE, 86 plus or minus 13 percent; TDE, 89 plus or minus 20 percent; and DDT 84 plus or minus 17 percent. Environmentally incurred-DDT residues were recovered at 4.1 ppm plus or minus 14 percent for p, p'DDE, 0.7 ppm plus or minus 24 percent for o, p'-DDT and 2.7 ppm plus or minus 17 percent for p p'-DDT. The DDT values calculated before the silicic acid separation compared favorably with those summarized. The multiresidue method for chlorinated pesticides, 29.001-29.027,, has been adopted official first action to include polychlorinated biphenyls in poultry fat and fish. (Holoman-Battelle)
W73-14273

LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY. COUPLING OF A LIQUID CHROMATOGRAPH TO A MASS SPECTROMETER,
Georgia Univ., Athens. Dept. of Biochemistry.
R. E. Lovins, S. R. Ellis, G. D. Tolbert, and C. R. McKinney.
Analytical Chemistry, Vol 45, No 8, p 1553-1556, July 1973. 8 fig, 7 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Laboratory equipment, *Pollutant identification, DDT, DDD, Dieldrin, *Chromatography, *Mass spectrometry, Instrumentation, Design.
Identifiers: Liquid chromatography, LC-mass spectrometry, Sulfathiazole, Sulfanilamide, Sulfamethazine, Anthraceine, Pyrene, Chrysene, Naphthalene, Chromatograms.

Because of the increasing utility of liquid chromatography in analytical and bio-analytical problems, the need for a reliable method of analyzing and identifying the effluent peaks generated by the liquid chromatograph has become apparent. For this purpose a system was designed to couple the liquid chromatograph to a mass spectrometer. The interface consisted of a motor driven probe to accept the effluent peaks from a liquid chromatograph, separate the solute from the solvent by flash evaporation in the probe tip, and automatically insert the isolated material into the ion source of the mass spectrometer for analysis. Results are given for the analysis of dieldrin, DDT, DDD, sulfathiazole, sulfanilamide, sulfamethazine, anthracene, pyrene, chrysene, and naphthalene. (Little-Battelle)
W73-14274

ASBESTOS FIBERS IN BEVERAGES, DRINKING WATER, AND TISSUES: THEIR PASSAGE THROUGH THE INTESTINAL WALL AND MOVEMENT THROUGH THE BODY,
Department of National Health and Welfare, Ottawa (Ontario). Food and Drug Research Lab.
H. M. Cunningham, and R. D. Pontefract.
Journal of the Association of Official Analytical Chemists, Vol 56, No 4, p 976-981, July 1973. 4 fig, 4 tab, 11 ref.

Descriptors: *Asbestos, *Electron microscopy, *Foods, *Rain, *Potable water, Rivers, Neutron activation analysis, Separation techniques, Water

pollution effects, Water pollution sources, Air, Air pollution, Water analysis, Snow, Path of pollutants, Distribution, Canada.
Identifiers: *Biological samples, Tissue, Blood, Spleen, Liver, Kidney, Omentum, Muscle, Lung, Brain, Soft drinks, Beer, Wine, Ottawa River, Sample preparation.

Methods were developed using an electron microscope to isolate and count asbestos fibers in liquids and tissues, Fibers were detected in beer, sherry, port, vermouth, soft drinks, and city drinking water at levels generally ranging from 1 to 11 million per liter. River water was higher in asbestos fibers than water passed through a city filtration system, and melted snow was considerably higher than river water. Asbestos fibers were also detected in parenteral solutions. Distribution studies on asbestos fibers administered to rats were performed with the electron microscope and were supplemented with studies using both tritiated and neutron-activated asbestos. Crysotile fibers were injected into the stomachs of rats and 2-4 days later fibers were isolated from the blood spleen, liver, kidney, omentum, muscle, lung, and brain. Highest levels of orally administered fibers were found in the omentum; intravenously injected fibers resulted in highest levels in the liver and the lung. (Little-Battelle)
W73-14275

QUANTITATIVE PERCHLORINATION OF POLYCHLORINATED BIPHENYLS AS A METHOD FOR CONFIRMATORY RESIDUE MEASUREMENT AND IDENTIFICATION.
Food and Drug Administration, Washington, D.C. Div. of Chemical Technology.
J. A. Armour.
Journal of the Association of Official Analytical Chemists, Vol 56, No 4, p 987-993, July 1973. 3 fig, 4 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Pollutant identification, *Chemical analysis, Methodology, Chemical reactions, Poultry, *Gas chromatography.
Identifiers: *Perchlorination method, Electron capture gas chromatography, Derivatives, Mixtures, *Quantitative analysis, Sample preparation, Decachlorobiphenyl, Chemical recovery, Aroclor 1242, Aroclor 1016, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, Chubs, Sturgeon, Animal tissues, Eggs, Fat, Sensitivity, Gas liquid chromatography.

The perchlorination procedure for derivatization of PCBs described by Berg, Diosady, and Rees has been modified to achieve a micro-scale quantitative conversion (greater than 90 percent) of commercial PCB preparations (Aroclors) to decachlorobiphenyl. Cleaned up sample extracts containing PCB residues (1-20 micrograms) are allowed to react with antimony pentachloride in the presence of chloroform to form decachlorobiphenyl. This procedure converts a multicomponent mixture to a single derivative detectable by electron capture GLC, thus providing an easy method for quantitating and identifying PCB residues and at the same time increasing the sensitivity of detection. The usefulness of the perchlorination procedure is demonstrated by comparing results for environmentally contaminated samples quantitated by 2 methods: by measuring the total area of the electron capture response for the residue against the Aroclor it most closely resembles, and by measuring the single peak of the decachlorobiphenyl derivative and expressing the results in terms of the particular Aroclor. (Homoman-Battelle)
W73-14276

POLYCHLORINATED TERPHENYLS AS POTENTIAL CONTAMINANTS OF ANIMAL PRODUCTS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
G. F. Fries, and G. S. Marrow.
Journal of the Association of Official Analytical Chemists, Vol 56, No 4, p 1002-1007, July 1973. 5 fig, 9 ref.

Descriptors: *Milk, *Silage, *Pollutant identification, *Chemical analysis, Sealants, Pollutants, Solvent extractions, *Gas chromatography.
Identifiers: *Polychlorinated terphenyls, Electron capture gas chromatography, Aroclor 5460, Sample preparation, Chemical recovery, Tetradecachloroterphenyls, Chemical interference, Gas liquid chromatography, Cleanup, Derivatives.

Evidence is presented of the presence of polychlorinated terphenyl (PCT) residues in samples of wall scrapings, silage and milk from farms where the PCT, Aroclor 5460 has been used in a sealant for concrete stave silos. Milk end silage samples were extracted and cleanup up using FDA multipesticide residue methodology; wall scrapings and the sealant sample were extracted and diluted, respectively, with hexane and examined by electron capture GLC without further cleanup. The cleaned up samples were chlorinated with SbC15 to form the 3 tetradecachloroterphenyl derivatives which facilitates identification of PCT residues by electron capture GLC. This work demonstrates that milk produced on farms with contaminated silos will contain PCT residues. Since the PCB and PCT residues are from the same source, correction of the PCB problem will also eliminate the PCT residues. The silo situation does provide good opportunity to study the comparative behavior of the 2 classes of compounds under environmental conditions. If the behavior is similar, it may be possible to predict the distribution and levels of PCT residues from information available on PCBs. (Holoman-Battelle)
W73-14277

MODIFICATIONS OF THE TECHNIQUE FOR DIFFERENTIATING CULTURES ISOLATED BY THE OFFICIAL AOAC SALMONELLA METHOD,
Food and Drug Administration, Washington, D.C. Div. of Microbiology.
P. L. Poelma, and A. Romero.
Journal of the Association of Official Analytical Chemists, Vol 56, No 4, p 1027-1028, July 1973. 3 ref.

Descriptors: *Salmonella, *Pollutant identification, *Methodology, *Separation techniques, *Cultures, Pathogenic bacteria, Aerobic bacteria, Isolation, Coliforms.
Identifiers: *Culturing techniques, *Arizona cultures, Selective media, Culture media.

Modifications are suggested for the official AOAC Salmonella method, 41.024-41.040, by which all colonies picked from selective plates are subcultured in both triple sugar and lysine iron agars. The techniques will detect Salmonella and Arizona cultures which might have been discarded. The revisions have been incorporated into the official method. (Holoman-Battelle)
W73-14278

COBALT INTERFERENCE IN THE NON--STEADY STATE CLEAN WATER TEST,
Camp, Dresser and McKee, Boston, Mass.
A. A. Kalinske, L. D. Lash, and G. L. Shell.
Water and Sewage Works, Vol 120, No 7, p 54-59, July 1973. 11 fig, 4 ref.

Descriptors: *Cobalt, *Dissolved oxygen, *Chemical analysis, *Water analysis, Heavy metals, Aeration, Methodology, Water quality, Water pollution, Cations, Laboratory tests.
Identifiers: *Ionic interference, *Chemical interference, *Winkler method, Error sources, Non-steady state reoxygenation test, Oxygen diffusion coefficient, Errors.

The purpose of this study was to evaluate the non-steady state method for determining oxygen transfer by aeration. It was observed that when sodium sulfite was used to deoxygenate the test water more than 0.05 mg/l cobalt ion concentration caused a chemical interference in the Winkler dissolved oxygen determination. This chemical interference varied with the cobalt ion concentration, the number of sulfite additions, the aeration period between tests and C sub s (saturation value for oxygen under test conditions). Values of oxygen input efficiency reported for aerators tested with cobalt ion concentrations greater than 0.05 mg/l can be high by as much as 10 to 50 percent. The degree of error will depend on the amount of cobalt ion used and the number of sulfite additions. If higher cobalt ion concentration is used, then the dissolved oxygen must be measured using a fast response dissolved oxygen probe. A meter which achieves 99 percent of the true value in 15 seconds (after swinging full scale) should be satisfactory. Cobalt interference in the determination of dissolved oxygen (Winkler method) in the non-steady state reoxygenation method may be reduced to insignificant levels by use of no higher than 0.05 mg/l cobalt ion. (Holoman-Battelle)
W73-14281

A RAPID, SENSITIVE METHOD FOR THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF POLLUTED WATERS,
Oak Ridge National Lab., Tenn.
W. W. Pitt, S. Katz, and L. H. Thacker.
In: Water-1972, AIChE Symposium Series, No 129, Vol 69, p 1-5, 1973. 2 tab, 8 ref, append.

Descriptors: *Chemical oxygen demand, *Water pollution, *Methodology, *Water analysis, *Chemical analysis, Waste water (Pollution), Organic compounds, Industrial wastes, Sewage effluents, Treatment facilities, Oxidation, Linear alkylate sulfonates, Natural streams.
Identifiers: *Cerate oxidation method, Acetic acid, Acetone, Benzene, Glucose, Ethanol, Glycine, Pyridine, Sodium lauryl sulfate.

A rapid, sensitive cerate oxidation method for measuring the chemical oxygen demand (COD) of waters is described. The pollutants are oxidized with perchloratocerate reagent, and the resulting cerium (III) is determined fluorometrically. Analysis requires only a few minutes for determinations at levels as low as 100 micrograms oxygen demand per liter. Results of tests on solutions of known organic compounds, an industrial waste stream, a domestic sewage plant effluent, and a natural stream show that the method compares favorably with the dichromate reflux procedure recommended by APHA. However, the new method is considerably faster and easier to use, and is a hundred times more sensitive. An analytical system which is suitable for use as either a continuous COD monitor or as an analyzer for multiple samples in series is also described. (Holoman-Battelle)
W73-14283

BIOLOGICAL EFFECTS OF COOLING TOWER BLOWDOWN,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W73-14285

THERMAL REMOTE SENSING ON THE MISSISSIPPI RIVER IN IOWA,
Geological Survey, Iowa City, Iowa.
S. J. Tuthill, J. V. Taranik, and B. E. Hoyer.
In: Water-1972, AIChE Symposium Series No 129, Vol 69, p 391-400 1973. 10 fig, 2 tab, 1 ref.

Descriptors: *Water temperature, *Remote sensing, *Mississippi River, River systems, Surface waters, Automation, *Thermal pollution, Telemetry, Aerial photography, Water pollution effects, Air temperature, Isotherms, Humidity, Wind velocity, Distribution, Data collections, Calibrations, Density, *Iowa.
Identifiers: *Thermal mapping, *Thermal infrared imagery, Accuracy, Isothermal maps, Isodensitracing, Thermal line scanner, Radiometers, Wind direction, Radiant energy, Ground truth data, Thermal imaging.

On 4 June, 1971, the Iowa Conservation Commission, Commonwealth Edison, and the Iowa Geological Survey studied the surface temperature distribution of the Mississippi River bordering Iowa. Airborne thermal mapping data were collected along a 180-mile length of river concurrent with surface measurements at 13 preselected areas. Density slicing the thermal imagery provided a method for generating an isothermal map. Results indicate further refinement of thermal mapping techniques could rapidly produce accurate thermal maps for complete river systems. (Holoman-Battelle)
W73-14286

ATOMIC ABSORPTION ANALYSIS OF STRONG HEAVY METAL CHELATING AGENTS IN WATER AND WASTE WATER,
Missouri Univ., Columbia. Dept. of Chemistry.
R. Kunkel, and S. E. Manahan.
Analytical Chemistry, Vol 45, No 8, p 1465-1468, July 1973. 4 fig, 2 tab, 6 ref.

Descriptors: *Heavy metals, Waste water (Pollution), *Pollutant identification, *Chemical analysis, *Methodology, Water analysis, Nitrilotriacetic acid, Water pollution, Chelation, Water pollution effects, Pollutants, Sewage effluents, Copper, Potable water, Activated sludge, Brines.
Identifiers: *Chelating agents, *Atomic absorption spectrophotometry, Natural waters, Chemical recovery, EDTA, Metal chelates, Ionic interference, Pollutant effects, Solubilization, Metal complexes, Chemical interference, Ammonium.

A method for the analysis of total strong heavy metal chelating agents in water is described. The method is based upon the solubilization of copper by the chelating agents at pH 10 followed by filtration and atomic absorption analysis of soluble copper in the filtrate. The analysis gives total levels of strong chelating agents, a significant parameter insofar as the properties of natural waters and waste waters are concerned. The method is simple, sensitive, and relatively free of interferences. It can be applied to the analysis of individual chelating agents after separation. (Holoman-Battelle)
W73-14287

INTERFERENCES IN NICKEL DETERMINATIONS BY ATOMIC ABSORPTION SPECTROMETRY,
California Univ., Los Angeles. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-14288

ESTIMATING INDUSTRIAL WATER POLLUTION IN SMALL REGIONS,
Livingston Coll., New Brunswick, N.J.
M. R. Greenberg, and R. Zimmerman.
Journal Water Pollution Control Federation, Vol 45, No 3, p 462-469, March 1973. 3 tab, 24 ref, append. OWRR-C1629 (no. 3147) (3). 14-13-0001-3147.

Descriptors: *Model studies, *Industrial wastes, Water pollution, *Estimating, *Regional analysis, *Pollutant identification, Surveys, Mathematical models, Mathematical studies, Pollutants, Data collections, Food processing industry, Textiles, Pulp and paper industry, Chemical industry, Oil industry, Tannery wastes, New York, Flow, Biochemical oxygen demand, Suspended solids, Chemical oxygen demand, Dissolved solids, Phenols, Nitrogen, Ammonia, Sulfides, Acidity, Hardness (Water), Proteins, Fluorides, Phosphorus, Chlorides, Halides, Chromium
Identifiers: Data interpretation, Metals industry, Grease, Volatile solids, Tin, Lubricating oils, Sulfuric acid, Hydrochloric acid, Iron Sulfate, Iron chloride, Cyanides.

Estimating industrial water pollution requires information on present levels of pollution and behavioral factors likely to bring about changes in the future. A model covering 26 pollution parameters was calibrated from readily available data for 2,026 plants in the New York region. The simulations produced a microspatial scale view of industrial pollution potential. Attempts to improve the model by collecting regional industrial surveys and questionnaires proved unrewarding because data remained incomplete and inconsistent with respect to location and timing of samples. The potential impact of federal regulations and technological changes on industrial effluent generation will be influenced largely by the organizational structures governing the abatement program. (Holoman-Battelle)
W73-14289

MICROANALYSIS WITH THE AID OF ION EXHANGE RESINS. XXVI. DETECTION OF SMALL QUANTITIES OF COPPER (II) WITH BATHOCUPROINE DISULFONATE, MIKROANALYSE MIT HILFE VON IONENAUSTAUSCHERN. XXVI NACHWEIS GERINGER MENGEN KUPFE R (II) MIT BATHOCUPROINDISULFONAT,
Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
T. Takahashi, T. Imamura, and M. Fujimoto.
Mikrochimica Acta, No 1, p 69-76, 1973. 5 tab, 10 ref.

Descriptors: *Copper, *Pollutant identification, Ion exchange, Iron, Cobalt, Nickel, Zinc, Molybdenum, Bromides, Nitrates, *Chemical analysis.
Identifiers: *Ion exchange resins, Detection limits, Trace levels, Ionic interference, Tungsten, Bathocuproine disulfonate.

A new resin spot test with bathocuproine disulfonate for the specific detection of ng amounts of copper (II) is described. Using 1 grain of white strongly basic popcorn-resin, Diaion PA 3-series, the identification limit for copper is 10.4 ng in 10 microliters solution (1: 1,000,000). (Holoman-Battelle)
W73-14290

THE MAYFLY (EPHEMEROPTERA) IN TROUT STREAMS OF THE BESKIDS. II. PRODUCTION, DIE EINTAGSFLIEGEN (EPHEMEROPTA) IN FORELLENBACHEN DER BESKIDEN. II. PRODUKTION),
Brno Univ. (Czechoslovakia). Zoological Inst.
M. Zelinka.
Hydrobiologia, Vol 42, No 1, p 13-19, July 6, 1973. 5 tab, 6 ref.

Descriptors: *Mayflies, *Secondary productivity, *Water quality, *Biomass, *Animal populations, Streams, Water temperature, Hydrogen ion concentration, Acidity, Alkalinity, Hardness (Water), Calcium, Magnesium, Dissolved oxygen, Ammonia, Nitrates, Nitrites, Phosphates.
Identifiers: Baetis rhodani, Rhithrogena semicolorata, Ecdyonurus, *Czechoslovakia.

The first part of this study (1969) dealt with the abundance and biomass of mayflies (Ephemeroptera). On the basis of the measurement of length of all mayflies and of the determination of the respective weight (according to the curve expressing the relation length weight) the production for each month was calculated. The annual average for Baetis rhodani amounted to 5.317 g/sq m, for Rhithrogena semicolorata 12.478 and for the species belonging to the genus Ecdyonurus 8.47 g/sq m. The relation between the annual production and average annual biomass was nearly the same in all three species equal to 1:8.37. These three taxa formed 76 percent of the biomass. After addition of the remaining taxa of mayflies the production of Ephemeroptera in the two brooks under investigation totalled 27, 152 g/sq m equal to 271,52 kg/ha per year. Water quality characteristics are tabulated for the streams. (Little-Battelle)
W73-14292

PRELIMINARY SURVEY OF MERCURY AND OTHER METALS CONTAINED IN ANIMALS FROM THE FRASER RIVER MUDELATS,
British Columbia, Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-14293

RAPID, SELECTIVE METHOD FOR LEAD BY FORCED-FLOW LIQUID CHROMATOGRAPHY,
Ames Lab., Iowa.
M. D. Seymour, and J. S. Fritz.
Analytical Chemistry, Vol 45, No 9, p 1632-1636, August 1973. 6 fig, 1 tab, 10 ref.

Descriptors: *Lead, *Separation techniques, *Aqueous solutions, *Pollutant identification, Heavy metals, *Anion exchange, Chemical analysis, Methodology, Selectivity, Ions, Nitrates, Molybdenum, *Chromatography.
Identifiers: Forced-flow liquid chromatography, Environmental samples, Accuracy, Precision, Chemical interference, Ionic interference, Rhodium, Antimony, Sample preparation, Rare earth elements.

A forced-flow ion exchange method for the separation of lead from metal ions has been described. Lead is measured in a manner similar to that described previously for iron. Lead (II) is retained on a small anion exchange column from 0.5 M hydrochloric acid and separated from many other metal ions. Then it is eluted with 8 M hydrochloric acid and the elution curve is recorded at 270 nm. The amount of lead is obtained from a plot of elution peak height vs. micrograms of lead. The entire separation sequence required only 8 min. There are two kinds of interference common to this type of analysis. Column overloading can cause alteration of peak shape and retention time and, hence, a dependency of peak height on matrix composition. The other type of interference is due to ions that are retained in 0.5 M HCl, stripped in 8.0 M HCl and absorbed at 270 nm. Of the cations tested, only three were found to interfere. Rhodium (III), antimony (V), and molybdenum (VI) were found to cause a 1 percent error in the analysis with metal/lead ratios of 0.009, 0.181, and 5.30, respectively. Nitrate ion can also cause error and should be driven off by taking the sample to dryness in concentrated hydrochloric acid prior to analysis. Several standard samples have been successfully analyzed for lead. (Holoman-Battelle)
W73-14295

DIRECT DETERMINATION OF PHOSPHORUS BY ATOMIC ABSORPTION FLAME SPECTROMETRY,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
G. F. Kirkbright, and M. Marshall.
Analytical Chemistry, Vol 45, No 9, p 1610-1613, August 1973. 1 fig, 3 tab, 13 ref.

Descriptors: *Phosphorus, *Pollutant identification, *Aqueous solutions, *Chemical analysis, Methodology, Nutrients.

Identifiers: *Atomic absorption spectrophotometry, Detection limits, Chemical interference, Yeast extract, Sensitivity, Accuracy, Molybdenum blue method, Beef extract, Biological samples, Milk products.

The direct determination of phosphorus by atomic absorption spectrometry at its 177.5-, 178.3-, and 178.8-nm resonance lines using a nitrogen-separated nitrous oxide-acetylene flame and a microwave-excited phosphorus electrodeless discharge lamp source is described. Phosphorus may be determined in aqueous solution as o-phosphate with a sensitivity of 4.8 and 5.4 micrograms/ml (for 1 percent absorption) at the 177.5- and 178.3-nm lines; the corresponding detection limits obtained at these wavelengths were 29 and 21 micrograms/ml, respectively. The high temperature and relatively transparent nature of the fuel-rich flame make it a convenient atom cell for the atomization of phosphorus; no significant chemical or physical interferences have been observed at the levels investigated. The results of a preliminary investigation of the application of the method to the direct determination of phosphorus in milk powder and yeast and beef extracts are described. (Holoman-Battelle)
W73-14296

ROLE OF SOLVENT EXTRACTION PARAMETERS IN GOVERNING THE POTENTIAL SELECTIVITY OF LIQUID MEMBRANE ELECTRODES,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 02K.
W73-14297

DETERMINATION OF AMMONIA IN AQUARIA AND IN SEA WATER USING THE AMMONIA ELECTRODE,
New England Aquarium, Boston, Mass.
T. R. Gilbert, and A. M. Clay.
Analytical Chemistry, Vol 45, No 9, p 1757-1759, August 1973. 1 fig, 3 tab, 7 ref.

Descriptors: *Ammonia, *Water analysis, *Sea water, *Aquaria, *Pollutant identification, Chemical analysis, Aqueous solutions, Pollutants, On-site tests, On-site investigations, Water quality, Water pollution, *Electrodes.
Identifiers: Ammonia electrodes, Ion selective electrodes, Precision, Reproducibility, Accuracy.

An ammonia electrode that has been fabricated for the analysis of ammonia in aqueous solutions consists of a hydrophobic gas-permeable membrane which separates the alkaline test solution from an internal solution 0.1 M in ammonium chloride. When the electrode is immersed in an alkaline test solution, ammonia can diffuse across the membrane, alter the NH3 concentration in the filling solution, and so cause a pH change which is monitored by the glass electrode. Electrode reproducibility was evaluated using samples from different marine life display tanks at the New England Aquarium with varying ammonia levels. The results indicate that the relative precision of these analyses was fairly constant over a wide concentration range. To test the accuracy of the method and to evaluate the electrode/portable unit as a tool for on-site analysis, a series of 1-liter samples of Boston Harbor water was collected. A Dorchester Bay sample was analyzed on site using the standard procedure described above with a battery powered magnetic stirring motor. With the meter in a horizontal position to minimize needle oscillation due to rocking of the boat, six analyses of the sample gave a mean value of 92 ppb NH3-N with a standard deviation of 3 ppb. Other samples were acidified to pH 3-4 with 6 M HCl to stabilize the ammonia and analyzed the same day in the laboratory by the electrode and also by the phenol-hypochlorite method. The data indicate that the electrode provides an accurate means of analyzing ammonia in sea water and that it is usually more precise than the spectrophotometric method. Furthermore, the performance of the electrode in the field is comparable to that observed in the laboratory, showing the technique to be well suited for field analysis. (Holoman-Battelle)
W73-14298

ENVIRONMENTAL ANALYSIS PROBLEMS CREATED BY UNEXPECTED VOLATILE BERYLLIUM COMPOUNDS IN VARIOUS SAMPLES,
Aerospace Research Labs., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 02K.
W73-14299

1-EPHEDRINE IN CHLOROFORM AS A SOLVENT FOR SILVER DIETHYLDITHIOCARBAMATE IN THE DETERMINATION OF ARSENIC,
National Environmental Research Center, Cincinnati, Ohio.
J. F. Kopp.
Analytical Chemistry, Vol 45, No 9, p 1786-1787, August 1973. 1 fig, 2 tab, 2 ref.

Descriptors: *Colorimetry, *Solvents, *Water analysis, Rivers, Sewage effluents, Waste water (Pollution), Odor, Absorption, Spectrophotometry.
Identifiers: *Arsenic, Sample preparation, Chemical interference, Accuracy, Acid digestion, Organic solvents.

1-EPHEDRINE IN CHLOROFORM WAS SUBSTITUTED FOR PYRIDINE AS A SOLVENT FOR SILVER DIETHYLDITHIOCARBAMATE IN THE COLORIMETRIC DETERMINATION OF ARSENIC IN WATER. This eliminates the objectionable odor associated with pyridine. Samples of river water, sewage effluent, and distilled water were analyzed by both procedures and the results compared. 1-ephedrine in chloroform gave an accuracy within the acceptable range. Cr, Co, Cu, Hg, Ni, Pt, and Sb may interfere with the method. However, levels normally encountered do not cause significant interference. As with the pyridine method, organically bound arsenic cannot be determined without an acid digestion step. (Little-Battelle)
W73-14300

PREPARATION AND PROPERTIES OF THE SULFATE ION SELECTIVE MEMBRANE ELECTRODE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-14301

ULTRAPURIFICATION OF WATER FOR ELECTROCHEMICAL AND SURFACE CHEMICAL WORK BY CATALYTIC PYRODISTILLATION,
Ottawa Univ. (Ontario). Dept. of Chemistry.
B. E. Conway, H. Angerstein-Kozlowska, W. B. A. Sharp, and E. E. Criddle.
Analytical Chemistry, Vol 45, No 8, p 1331-1336, July 1973. 7 fig, 27 ref.

Descriptors: *Water purification, Organic matter, Optical properties, Water, Water analysis, *Electrochemistry.
Identifiers: *Ultrapure water, *Catalytic Pyrodistillation, Ion selective electrodes.

Recently, domestic and industrial water supplies have become contaminated by organic impurities that cannot be removed by ordinary or oxidative distillation because of steam volatility of the impurities of their derivatives. The results of using a pyrocatalytic distillation system for preparation of ultrapure water for electrochemical and surface chemical work are described. Exacting electrochemical and optical criteria are defined for judging and characterizing the purity of water, with respect to organic impurities, especially with regard to their effects at Pt and Hg electrodes. (Little-Battelle)
W73-14302

DETERMINATION OF TRACE PHENOL IN AQUEOUS SOLUTION BY AQUEOUS LIQUID CHROMATOGRAPHY,
Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Inst. of Science.
K. Bhatia.
Analytical Chemistry, Vol 45, No 8, p 1344-1347, July 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Phenols, *Pollutant identification, Waste water (Pollution), Water analysis, *Aqueous solutions, Industrial wastes, Solvents, *Chromatography.
Identifiers: *Liquid chromatography, *Chemical interference, Detection limits, Phenolic terphenyls, Beta-naphthol, Alpha-naphthol, Sensitivity, Aromatic hydrocarbons, Organic solvents, Benzene, Bromobenzene, Pyridine, Aniline, Bromophenols, Chlorinated hydrocarbons, Chlorphenols, Catchol, Resorcinol, Hydroquinone, Quinone, Trihydroxybenzenes, Aminophenols, Biphenyls, Phenylphenol, Indoles.

Liquid chromatographic methods capable of use both for identification of trace quantities of phenols in aqueous solution and for the quantitative analysis of mixtures whose components are known are described. An optical detector utilizing the 254-nm mercury resonance line was used. Phenol in the aqueous phase can be accurately determined down to 0.00001 M (less than mg/l). Further improvement in the sensitivity of the method for quantitative analysis of phenol can be achieved by using larger samples and a detector operating at about 270 nm. The presence of di- and trihydroxybenzenes, most other substituted phenols, naphthols, and phenolic bi- and terphenyls in the solutions does not interfere in the determination of phenol. The application of aqueous liquid chromatography to the determination of phenols in industrial waste waters is demonstrated. The methods can be easily extended to the determination of individual substituted phenols down to at least 0.00001 M. (Little-Battelle)
W73-14303

CORRELATION OF ENHANCEMENT OF ATOMIC ABSORPTION SENSITIVITY FOR SELECTED METAL IONS WITH PHYSICAL PROPERTIES OF ORGANIC SOLVENTS,
Murray State Univ., Ky. Dept. of Chemistry.
A. J. Lemonds, and B. E. McClellan.
Analytical Chemistry, Vol 45, No 8, p 1455-1460, July 1973. 6 fig, 3 tab, 20 ref.

Descriptors: *Heavy metals, Cadmium, Nickel, Cobalt, Zinc, Solvents, Aqueous solutions, *Spectrophotometry, Alcohols.
Identifiers: *Atomic absorption spectrophotometry, *Organic solvents, Signal enhancement, Esters, Silver, Sensitivity, Ketones.

Various alcohols, ketones, esters, and other organic compounds, as solvents for Ag, Cd, Co, Ni, and Zn ions, were studied to determine the enhancement of atomic absorption values for each metal-solvent system and to correlate the enhancement values with the physical properties of the solvents. Optimum instrumental conditions were determined for each metal-solvent system employing two different burner-aspirator systems. Absorbance values for the metal-organic solvent systems were measured and compared with the absorbance values for the aqueous system of the same concentration in order to calculate an enhancement value. Plots of enhancement vs. log viscosity and enhancement vs. log boiling point for

each ion resulted in lines with negative slopes. Various plots involving density and surface tension showed little or no dependence of enhancement on either of the constants. However, a linear relationship existed between log (viscosity X boiling point) and enhancement. (Little-Battelle)
W73-14304

ESTIMATING PRECISION FOR THE METHOD OF STANDARD ADDITIONS,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 02K.
W73-14305

SELECTED METALS IN SEDIMENTS, WATER, AND BIOTA IN THE ILLINOIS RIVER,
Bradley Univ., Peoria, Ill. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-14308

REDUCTION AND EVALUATION OF BIOLOGICAL DATA,
Environmental Protection Agency, Ada, Okla. Office of Technical Programs.
R. D. Harkins, and R. E. Austin.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1606-1611, July 1973. 1 fig, 2 tab, 11 ref.

Descriptors: *Sampling, *Mathematical studies, Water pollution, Equations, Biological communities, Computer programs, Bioindicators, Water quality, Statistical methods, *Louisiana.
Identifiers: *Data interpretation, Artificial substrates, Species diversity, Anacoco Bayou, *Sabine River, Biological indexes, Rock baskets, Multiplate samplers.

Aquatic organisms were collected from the area surrounding the confluence of Anacoco Bayou and the Sabine River, Louisiana, in an attempt to develop a single biological index useful in evaluating water quality. A secondary objective was to compare artificial substrate samplers: rock-filled baskets and multiplate samplers. Samplers were retrieved after 4 weeks, and the organisms harvested by scrubbing, identified, and counted. An equation based on information theory was developed to process the data. Computer programs were written to do the calculations as well as the analysis of variance. It is concluded that the method can objectively reduce several biological indexes to a single meaningful value. Resulting sets of standardized distance values can be compared subjectively or can be subjected to statistical evaluation and probability levels of differences assessed. There was no indication of differences between samplers or interaction between samplers and site. (Little-Battelle)
W73-14310

PROTEINS IN WASTEWATER AND WASTEWATER SLUDGES,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
M. K. C. Sridhar, and S. C. Pillai.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1595-1600, July 1973. 1 fig, 2 tab, 32 ref.

Descriptors: Waste water (Pollution), *Activated sludge, Septic tanks, *Proteins, *Sewage bacteria, *Sewage sludge, *Protozoa, *Pollutant identification, Solubility, Nitrogen, Amino acids, Solvent extractions, Biomass, Water, Sodium chloride.
Identifiers: Organic solvents, Inorganic solvents, Epistylis articulata, Albumins, Globulins, Glutelins, Prolamins, Ciliates, Bacterial populations, Sodium hydroxide, Acetic acid, Ethanol.

The proteins found in raw wastewater, septic tank sludge, activated sludge, the mixed bacteria from activated sludge, the dominant protozoan Epistylis articulata in activated sludge, and the bacteria associated with the protozoan were identified on the basis of their solubilities in several solvents. On an equal dry-weight basis, these materials contained about 11, 17, 43, 73, 60, and 78 percent total proteins, respectively. Qualitatively, there were striking similarities between raw wastewater and septic tank sludge, between activated sludge and the protozoan, and between the two bacterial preparations in the distribution of the different protein fractions (albumins, globulins, glutelins, and prolamins). These observations seem to be of considerable significance in the study of the microbiology of wastewater and sludges and their protein contents. (Holoman-Battelle)
W73-14311

FINAL REPORT ON DRIFT STATION BIOLOGY: ZOOPLANKTON TAXONOMY AND SORTING PROGRAMS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W73-14312

SOME ROTIFERS FROM CAMBODIA,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 02I.
W73-14313

THE TESTACEA IN THE AREA OF BUSCHELBACH STATION (BIEBER/SPESSART, GERMANY), (DIE TESTACEEN IN DER UMGEBUNG DER STATION BUSCHELBACH (SPESSART/BRD)),
Salzburg Univ. (Austria). Lunz Biological Station.
For primary bibliographic entry see Field 02I.
W73-14314

WATER CHARACTERISTICS,
Maine Univ., Orono.
M. M. Ghosh.
Journal Water Pollution Control Federation, Vol 45, No 6, p 986-995, June 1973. 72 ref.

Descriptors: *Water analysis, *Water quality, *Reviews, *Bibliographies, Hydrogen ion concentration, Acidity, Alkalinity, Color, Odor, Turbidity, Suspended solids, Water temperature, Conductivity, Ammonia, Oxidation-reduction potential, Radioactivity, Monitoring, Instrumentation, Filtration, Phytoplankton, Waste water (Pollution), Spectrophotometry, Automation.
Identifiers: Sample preparation, Data interpretation, Detection limits, Particulate matter, Dissociation constants, Polystyrene latex, Gas liquid chromatography, Turbidimeters, Odormeter, Ion selective electrodes, Membrane electrodes, Iodates, Chromates, Recorders, Photon activation analysis, Charged particle activation, Sr-90, Cs-137, Ce-144, Coprecipitation, Fe-59, Zr-95, Ru-106, Co-60, Zn-65, Y-90.

The 1972 literature on methods for determining water characteristics is reviewed. Methods are considered for pH, acidity, alkalinity, color, odor, residue, turbidity, suspended solids, temperature, conductivity, particulate matter, ammonia, redox, radioactivity, and concentration of phytoplankton. Models and mathematical relationships for interpreting data are also reviewed. (Little-Battelle)
W73-14316

ORGANICS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. A. Minear, J. J. Benko, P. T. Lambert, J. R. Marsh, and C. M. Palesh.
Journal Water Pollution Control Federation, Vol 45, No 6, p 995-1018, June 1973. 1 tab, 155 ref.

Descriptors: *Analytical techniques, *Organic compounds, *Pollutant identification, *Bibliographies, Detergents, *Oxygen demand, *Reviews, Water analysis, Surfactants, Toxicity, Oil, *Pesticides, Polychlorinated biphenyls, Organophosphorus pesticides, Carbamate pesticides, Vitamin B, Water quality, Biochemical oxygen demand, Benthos, Chemical oxygen demand, Automation, Monitoring, Feed lots, Runoff, Waste water (Pollution), Absorption, Biomass.
Identifiers: Biological samples, Ion selective electrodes, Oxygen demand index, Organic carbon, Detection limits, Thermal analysis, Flame ionization detectors, Adenosine triphosphate, Carboxymethylcellulose, Anionic detergents, Nonionic detergents, Macroinvertebrates, Ostrea erdules, Crassostrea gigas, Characterization, Oil characterization, Fuel oil, Oil residues, Crude oil, Lasers, Radar, Oil dispersants, Grease, Gasoline.

Literature from 1972 is reviewed with respect to analytical methods for oxygen demand, organic carbon, detergents, oil, grease, and organochlorine, organophosphorus, and carbamate pesticides. Toxic effects of the pollutants are discussed. (Little-Battelle)
W73-14317

CONTINUOUS MONITORING, AUTOMATED ANALYSIS, AND SAMPLING PROCEDURES,
Michigan Univ., Ann Arbor.
S. E. Herbes, and H. E. Allen.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1018-1026, June 1973. 81 ref.

Descriptors: *Monitoring, Chemical analysis, *Reviews, *Bibliographies, *Water quality, *Sampling, *Water analysis, *Instrumentation, Automation, Industrial wastes, Dissolved oxygen, Conductivity, Suspended solids, Water temperature, Pollutant identification, Oxidation-reduction potential, Hydrogen ion concentration, Ammonia, Organic compounds, Oil, Chlorides, Nitrates, Flow rates, Phenols, Chemical oxygen demand, Silica, Hardness (Water), Iron, Phosphates, Chlorine, Manganese, Nutrients, Gas chromatography, Pesticides, Nitrites, Detergents, Sediments, Data processing, Calibrations, Sewage bacteria, Respiration, Water pollution effects, Rivers, Photometry, Oil spills, Remote sensing, Absorption, Ultraviolet radiation, Infrared radiation, Heavy metals, Fluorescence, Fluorometry, Chlorophyll, Cadmium, Aluminum, Spectrophotometry, Separation techniques, Sodium, Deuterium, Mass spectrometry, Volumetric analysis, Alkalinity, Sulfates, Sulfides, Colorimetry, Silicates, Surfactants, Nitrogen, Radar, Flame photometry, Waste water (Pollution), Automatic control, On-site investigations.
Identifiers: Ion selective electrodes, Detection limits, Organic carbon, Autoanalyzer, Ozone, Hydrazine, Turbidimeters, Anionic detergents, Chronopotentiometry, Voltammetry, Aromatic hydrocarbons, Differential photometry, Differential polarization, Microwave, Multispectral sensing system, Lasers, Lignin sulfonate, Chlorophyll a, Atomic absorption spectrophotometry, Sensitivity, Vanadium, Chemical interference, Potentiometry, Cyanides, Kjeldahl nitrogen, Sample preservation.

The 1972 literature is reviewed with respect to capabilities for monitoring, automatically analyzing, and sampling water for water quality parameters and the presence of organic and inorganic pollutants. A brief discussion is included of remote monitoring systems, automatic laboratory analysis, remote sensing, data handling, and sampling frequency. (Little-Battelle)
W73-14318

WATER QUALITY MONITORING ON THE MISSISSIPPI RIVER HAS ITS PITFALLS,
Saint Louis Metropolitan Sewer District, Mo.
For primary bibliographic entry see Field 05B.
W73-14320

)ME INSTRUMENTS AVAILABLE NOW FOR HE MEASUREMENT OF WASTEWATER ARAMETERS,
nics, Inc., Watertown, Mass. Instrument Div.
L. Brown.
: Water-1972, AIChE Symposium Series No 9, Vol 69, p 585-588, 1973. 7 fig, 2 ref.

escriptors: *Instrumentation, *Monitoring, *One data collections, *Laboratory tests, Waste ater (Pollution), *Water properties, *Measurent, Water quality, Chemical analysis, Autoatic control, Pollutant identification, Operations, ysical properties, Laboratory equipment, emical properties, Oxygen demand, Volumetric alysis, Water analysis, Carbon dioxide, Water llution, Water temperature, Dissolved oxygen, ydrogen ion concentration, Conductivity, ydrogen, Nitrogen, Sulfur, Carbon, Oxygen.
entifiers: On-line measurement, Organic carbon, ssolved oxygen analyzers, Total carbon alyzer, Organic carbon analyzer, Total organic rbon, Total oxygen demand, Total oxygen deand analyzer, Reliability, Reproducibility, Cyades, Potentiometric titration.

brief summary and a student review and critique e given of the instruments presently available for easuring wastewater parameters. These instruents include dissolved oxygen analyzer, multirameter water quality monitor, total carbon alyzer, organic carbon analyzer, total oxygen mand analyzer, an on-line, automatic titrator, d an instrument for measuring carbon dioxide mand. (Holoman-Battelle)
73-14321

EASUREMENT OF ORGANIC WASTE-ATER PARAMETERS,
attelle Memorial Inst., Columbus, Ohio. Organic hemical Div.
. B. Neher.
: Water-1972, AIChE Symposium Series No. 29, Vol 69, p 600-602. 1973.

escriptors: *Monitoring, *Waste water (Pollution), *Organic wastes, *Measurement, *Pollutant entification, *Instrumentation, Properties, Pollutants, Biochemical oxygen demand, Chemical xygen demand, Automatic control, Digital comuters, Mass spectrometry, Sampling, Methodoloy.
dentifiers: Process streams, GC-Mass spectometry, Infrared spectrophotometry, Gas liquid hromatography, Total organic carbon, Total oxgen demand.

echniques are discussed for the measurement of rganic wastewater parameters including BOD, otal carbon, total organic carbon, total oxygen deand, and COD. The analytical instruments are (1) ontinuous monitoring and (2) intermittent samling instruments which include automated GLC, mass spectrometer, digital computer prorammed gas chromatograph-mass spectrometers, nd infrared spectrometry. Only a limited number f organic parameters, however, can be measured n a continuous basis. Also only a few instruments re available for monitoring the organic content of vater, and these give measurements only of total rganic carbon content. The drawback for control urposes would seem to be an inability to specify rganic constitutents and demonstrate a toxicity ffect of a wastewater. (Holoman-Battelle)
W73-14322

PRACTICAL EXPERIENCE OF THE WATER RESOURCES DIVISION IN THE USE OF MULTIPARAMETER ELECTRONIC RECORDERS AND AUTOMATED TECHNIQUES FOR MONITORING WATER QUALITY IN STREAMS,
Geological Survey, Washington, D.C. Water Resources Div.
R. J. Pickering.
In: Water-1972, AIChE Symposium Series No. 129, Vol 69, p 603-606. 1973. 3 ref.

Descriptors: *Monitoring, *Water quality, *Automation, *Electronic equipment, Water analysis, Data transmission, Methodology, Data collections, Water properties, Water temperature, Specific conductivity, Dissolved oxygen, Hydrogen ion concentration, Turbidity, Ammonia, Nitrates, Nitrites, Phosphates, Streams, Flow rates, Telemetry, Maintenance, Streamflow, Pumps.
Identifiers: *Recorders.

The stream monitoring practices of the U. S. Geological Survey are reported along with the difficulties experienced in using field monitoring equipment. The parameters measured are: specific conductance, temperature, dissolved oxygen, pH, turbidity, ammonia, nitrate, nitrite, and hydrolyzable phosphates. The first five parameters are electronically monitored; the last four are monitored by wet chemistry techniques. A bubbler method is used for stream flow measurements. The wet chemistry analyzers require the most attention. Telemetering of data involves the collection of measurements taken at several sampling sites. The recorders are digital to make telemetering simpler. Perhaps in the future such data can be collected and transmitted by satellite to a centrally located ground acquisitioning site for computer management. (Little-Battelle)
W73-14323

FACTORS INFLUENCING THE FREQUENCY OF SAMPLING,
PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio.
G. Jutze.
In: Water-1972, AIChE Symposium Series No. 129, Vol 69, p 610-611. 1973.

Descriptors: *Sampling, *Waste water (Pollution), Treatment facilities, *Frequency, *Monitoring, Sewage effluents, Waste assimilative capacity, Waste water treatment, Flow, Properties, Methodology, Toxicity.

Sampling frequency is an indispensable consideration in determining how wastewater parameters are to be measured. The factors that must be considered in determining monitoring frequency are: (1) variability of incoming waste, its flow and characteristics; (2) characteristics of the process; and (3) the effect of process upset on receiving streams. (Holoman-Battelle)
W73-14324

REMOTE ANALYSIS OF AIRBORNE PARTICLES BY POLARIMETRY,
Arizona Univ., Tucson. Lunar and Planetary Lab.
For primary bibliographic entry see Field 07B.
W73-14341

THE ANALYSIS OF TRITIUM OXIDE FROM SELECTED AREAS OF THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
D. M. Skauen.
Available from the National Technical Information Service as PB-223 499, $2.75 in paper copy, $1.45 in microfiche. Completion Report, 1973. 8 p, 9 tab, 1 fig, 1 ref. OWRR A-044-CONN (1). 14-31-0001-3507.

Descriptors: Tritium, *Spectroscopy, Environment, Water sampling, *Connecticut River, Analytical techniques, *Pollutant identification.
Identifiers: *Tritium oxide, *Liquid scintillation spectroscopy.

Various techniques for the estimation of low-level tritium oxide were considered. A method based on liquid scintillation spectroscopy was selected as the most useful for routine analysis. All instrument and sample preparation parameters were studied experimentally for their applicability to the type of samples to be analyzed. The analytical technique thus developed was used to determine the tritium oxide in a variety of water samples including winter and spring samples from the Connecticut River in 1973.
W73-14362

REMOTE SENSING OF WATER QUALITY: A STATE OF THE ART REPORT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. J. Mitsch.
Available from the National Technical Information Service as PB-223 503, $2.75 in paper copy, $1.45 in microfiche. Florida Water Resources Research Center Publication No. 21, 1973. 14 p, 9 fig, 43 ref. OWRR A-999-FLA (5). 14-31-0001-3809.

Descriptors: *Remote sensing, Photogrammetry, *Water quality, Reviews, Natural resources, *Satellites (Artificial), *Pollutant identification.
Identifiers: Infrared scanning, Multispectral scanning, *Earth resources satellite.

Remote sensing, or the carrying out of aerial or space surveys of the earth's surface, is finding several applications in the fields of water quality and water resource management. It offers a means of obtaining large amounts of data, but its value is in the expansion of data in the spatial, temporal and spectral modes. The most valuable techniques presently are photography, infrared scanning and multispectral scanning. Aircraft applications include the measuring of the distribution of various waste discharges into water bodies and the study of aquatic plant growth and benthic communities. The ERTS (Earth Resources Technology Satellite) program of the U. S. Department of the Interior is investigating satellite applications of monitoring the earth's resources. The water resource applications are less obvious than those of the aircraft and concern environmental indicators on a much larger scale. However, the satellite offers the enhancement of data in the temporal mode with periodic remote sensing of most of the earth's surface. (Morgan-Florida)
W73-14363

STRIP-MINED WATERSHED HYDROLOGIC DATA ACQUISITION STUDY,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07B.
W73-14368

LOW LEVEL BOD DETERMINATIONS BY THE ELECTROLYSIS METHOD,
Iowa State Univ., Ames.
J. A. Merideth.
Master's Thesis, 1969, 155 p, 18 fig, 12 tab, 38 ref.

Descriptors: *Biochemical oxygen demand, *Electrolysis, *Laboratory tests, Instrumentation, Nitrification, Nutrients, Time lag, Statistical methods, Water analysis, Water quality control, *Waste water treatment, Analytical techniques.
Identifiers: *Dilution method, *Seed concentration, Standard deviations.

Low strength synthetic substrates and actual stream samples were analyzed using the Standard Method's BOD test and by electrolysis, to determine the adaptability of the electrolysis technique to low level BOD waters and compare the results obtained to those obtained with the standard test. Conclusions drawn from inital testing included: (1) seed concentration has a definite effect on both K and L values since it effects lag times; (2) nitrification should either be inhibited or accounted for in BOD determinations; (3) addition of nutrients to low BOD stream water produced little or no effect on the BOD determination; (4) CO2 adsorption during electrolysis did not inhibit oxygen demand

exertion; (5) deviations of from 3.5 to 6% of the average 5day BOD values were obtained by electrolysis. In comparing the two methods it was found that: (1) both methods require the same time for one reading, but if daily readings are to be taken the electrolysis method is much more efficient; (2) the electrolysis method was demonstrated to be at least equal, if not superior, to the dilution method for accuracy of results; and (3) the lower the BOD value of the sample, the more difficult it will be to obtain close agreement of values for either method. (Lowry-Texas)
W73-14391

THE APPLICATION OF GAS CHROMATOGRAPHY OF VOLATILE METAL CHELATES TO WATER ANALYSIS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 02K.
W73-14393

DIRECT VAPORIZATION AND QUANTIFICATION OF ARSENIC FROM SOILS AND WATER,
Texas A and M Univ., College Station. Dept. of Agricultural Analytical Services; and Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
J. R. Melton, W. L. Hoover, J. L. Ayers, and P. A. Howard.
Soil Science Society of America Proceedings, Vol 37, No 4, p 558-561, July-August 1973. 3 fig, 3 tab, 9 ref.

Descriptors: *Arsenic compounds, *Chemical analysis, *Spectrophotometry, *Flame photometry, Soil chemistry, Water chemistry, Water analysis.
Identifiers: *Arsine.

A procedure is described for the determination of arsenic in soils at the parts per million level and water at the parts per billion level. Determinations are made by direct introduction of arsine gas into the flame of an atomic absorption spectrophotometer. An easily constructed apparatus is described for introducing arsine into the flame. Soils from various states, as well as water samples from Texas waterways, are studied for arsenic content. Recoveries of arsenic added to soils and water samples ranged from 93.0% to 106.0%. (Knapp-USGS)
W73-14416

SIMPLE ARRANGEMENT FOR THE DETECTION OF SULPHUR IN GAS-CHROMATOGRAPHIC ELUATES, (EINFACHE ANORDNUNG ZUM NACHIWEIS VON SCHWEFEL IN GAS-CHROMATOGRAPHISCHEN ELUATEN),
Universitaet des Saarlandes, Saarbruechen (West Germany). Institut fuer Analytische Chemie und Radiochemie.
E. Blasius, and H. Lohde.
Zeitschrift fur Analytische Chemie, Vol 264, No 4, p 286-289, May 7, 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Gas chromatography, *Sulfur, *Pollutant identification, Laboratory equipment.
Identifiers: *Detection limits, Sample preparation.

The described apparatus for the detection of sulphur in gas-chromatographic eluates is based on the hydrogenation of compounds of sulphur to H2S and its detection with a thin-layer plate containing Pb (CH3COO)2. The Pbs zones obtained can be evaluated optically, too, by measurement of the degree of remission. The limit of detection is 5 ng of sulphur (as CS2). Sixteen sulphur compounds can be detected in the pyrograms of a strong acid cation-exchanger. (Little-Battelle)
W73-14438

THE SPECTROPHOTOMETRIC DETERMINATION OF PALLADIUM WITH 4- ((5-CHLORO--2-PYRIDYL)AZO)-1,3-DIAMINOBENZENE,
Government Industrial Research Inst., Nagoya (Japan).
S. Shibata, Y. Ishiguro, and R. Nakashima.
Analytica Chimica Acta, Vol 64, No 2, p 305-309, April 1973. 4 fig, 2 tab, 5 ref.

Descriptors: *Water analysis, *Spectrophotometry, *Aqueous solutions, Heavy metals, Calibrations, Pollutant identification, Absorption.
Identifiers: *Palladium, Sample preparation, Sensitivity, Chemical interference, Calibration curves.

Using 4- ((5-chloro-2-pyridyl)azo)-1,3-diaminobenzene (5-Cl-PADAB) as the reagent, microgram amounts of palladium can be determined by spectrophotometry. The recommended procedure is as follows. To a 25-ml volumetric flask, transfer a suitable aliquot of acidic sample solution containing up to 25 micrograms of palladium, and add 0.5 ml of ethanolic 0.08 percent reagent solution. Then add 5 ml of (1 plus 1) hydrochloric acid solution, dilute to volume and mix well. Measure the absorbance of the palladium complex produced at 572 nm against a reagent blank. Obtain the concentration of palladium from a standard calibration curve obtained under identical conditions. The calibration curve proved to be linear up to 1 ppm Pd. Interference tests showed that Al, Be, Bi, Cd, rare earths, Mg, Ca, Mn, Pb, Th, Ti, U, Zn, Zr in 5 mg amounts, V, W, Ni, Cr, in 1-2 mg amounts, and 0.5 mg of Co did not interfere. Five-fold amounts of iron (III) and two-fold amounts of copper did not interfere. Interference was caused only by chromium (VI). Common anions such as chloride, nitrate, acetate, sulfate and perchlorate did not interfere. Strong oxidizing agents interfered. (Little-Battelle)
W73-14440

ATOMIC ABSORPTION AND FLUORESCENCE SPECTROMETRY WITH A CARBON FILAMENT ATOM RESERVOIR. PART XIII. THE DETERMINATION OF CHROMIUM WITH A FULLY ENCLOSED ATOM RESERVOIR,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
K. W. Jackson, T. S. West, and L. Balchin.
Analytica Chimica Acta, Vol 64, No 3, p 363-369, May 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Chromium, Heavy metals, Laboratory equipment, Aqueous solutions, *Water analysis, *Spectrophotometry.
Identifiers: *Chemical interference, *Atomic absorption spectrophotometry, Sensitivity, Detection limits, Atom reservoir.

The detection and measurement of chromium by atomic absorption spectrometry with a carbon filament atom reservoir is described. At a wavelength of 357.9 nm, a sensitivity (1 percent absorption) of 9.2 X 10 to the minus 12 power g was obtained. The detection limit was 10 to the minus 11 power g; in terms of concentration this is similar to that normally detectable in a flame. Interferences resulting from the presence of various levels of Sr, Fe (III), Co (II), Cu (II), Ca, Ba, Al, Sn (II), Sb, RB, Ti (IV), Pb, Mn (II, Zn, Hg (II), and V (V) were determined. (Little-Battelle)
W73-14441

THE FLUORIMETRIC DETERMINATION OF MERCURY,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
J. Holzbecher, and D. E. Ryan.
Analytica Chimica Acta, Vol 64, No 3, p 333-336, May 1973. 2 fig, 3 ref.

Descriptors: *Water analysis, *Mercury, *Fluorometry, Aqueous solutions, Heavy metals, Fluorescence, Calibrations.
Identifiers: *Sample preparation, Precision, Chemical interference, Detection limits, Organomercury compounds, Calibration curves.

The use of thiamine for the fluorometric determination of mercury is described. Stock solutions for analysis were prepared from mercury (II) chloride. The analytical procedure involved adding several milliliters of approximately neutral unknown solution (10-500 ng Hg per ml) and thiamine reagent to a borate buffer and making up to volume with twice-distilled water. It is important that the resulting solution contain less than 0.02 M foreign salts. The fluorescence intensity is measured at 440 nm after 1 hr or more, the excitation wavelength is 375 nm. Mercury must be present in the divalent state since Hg (I) gives a fluorescent intensity about half that of Hg (II). Organomercury compounds can only be analyzed after destruction of organic matter by acid digestion and conversion to inorganic Hg (II). Mercury (II) was successfully determined in the presence of a 10,000-fold (molar) amount of nickel (II), cobalt (II) or zinc (II); a 1000-fold amount of copper (II), cadmium (II), manganese (II) or aluminum (III); or a 100-fold amount of iron (II) or iron (III). Similarly, 100,000-fold amounts of the sodium or potassium salts of acetate, chloride, citrate, sulfate or tartrate did not interfere. A 10,000-fold amount of fluoride, nitrate, perchlorate or phosphate, and a 1000-fold amount of bromide and thiocyanate could be tolerated; the fluorescence was quenched by equivalent amounts of cyanide, iodide, sulphide or EDTA. Tap water samples spiked with mercury (II) chloride were anlyzed by this procedure with a relative error of determination of less than 5 percent. (Little-Battelle)
W73-14442

ISOLATION AND PROPERTIES OF RIBONUCLEASE-DEFICIENT MUTANT OF SALMONELLA TYPHIMURIUM,
California Univ., Davis. Dept. of Bacteriology.
C. T. Wehr.
Journal of Bacteriology, Vol 114, No 1, p 96-102, April 1973. 5 tab, 33 ref.

Descriptors: *Enzymes, *Separation techniques, *Growth rates, Cultures, Salmonella, *Isolation.
Identifiers: *Salmonella typhimurium, Mutants.

A mutant of Salmonella typhimurium has been isolated that has less than 5 percent of the ribonuclease activity of the parent strain. Mutant screening and enzyme assays were done in the presence of ethylenediaminetetraacetic acid, a substance that activates ribonuclease I and inhibits other known microbial nucleases. The enzyme may perform a scavenge function in the utilization of exogenous ribonucleic acid. Loss of this enzyme seems to have no detrimental effects on the growth of Salmonella. (Little-Battelle)
W73-14443

CALCULATION OF TURBIDIMETRIC MICROBIOLOGICAL VITAMIN ASSAY RESULTS, USING AN APL/360 COMPUTER PROGRAM,
Food and Drug Administration, Washington, D.C. Div. of Nutrition.
G. V. Brolund, E. W. Haskins, and G. A. Hudson.
Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 754-757, May 3, 1973. 5 fig, 1 tab, 3 ref.

Descriptors: *Computer programs, *Cultures, *Bioassay, *Vitamins, Turbidity, Equations, Microbiology, Data processing.

An APL-360 computer program is described for the calculation of results from microbiological vitamin assays. The results are compared to

al calculations specified in official AOAC ods. This comparison shows the validity of omputer program for these calculations. (Lit-attelle)
14448

ACHOPHORESIS ON PAPER. PART II. SEPARATION OF AG (I), TL (I), HG2 (2) AND PB (II),
iglio Nazionale delle Ricerche, Rome (Italy). ratorio di Cromatografia.
glia.
al of Chromatography, Vol 79, p 380-382, 16, 1973. 3 fig, 2 ref.

riptors: *Separation techniques, *Lead, cury, Heavy metals, Analytical techniques.
ifiers: *Silver, *Thallium, *Isotachophoresis.

natman No. 1 paper strip, sprayed with potas- chromate, was sandwiched between two plates and potential of 400 V applied for chophoretic separation of silver, mercurous ury, lead (II), and thallium (I). Nitric acid was as the leading electrolyte, and lithium nitrate e terminating electrolyte. This simple unbuf- system permits the concentration and ation of both Ag (I) and Tl (I) and a complete ation of all four members of the silver group. e-Battelle)
-14449

RITE REDUCTASE-DEFICIENT MUTANTS SCHERICHIA COLI K12,
inham Univ. (England). Dept. of Biochemis-

Cole, and F. B. Ward.
nal of General Microbiology, Vol 76, No 1, p , May 1973. 2 fig, 3 tab, 20 ref.

riptors: *E. Coli, *Separation techniques, luction (Chemical), Cultures, *Nitrites, ates, Sulfites, Enzymes, *Isolation.
tifiers: Mutants, Nitrate reductase.

ants of Escherichia coli K12 have been iso- which reduce nitrite 3 to 30 percent as rapidly ne wild-type. Activities of reduced nicotina- adenine dinucleotide (NADH)-nitrite ox- eductase were lower in cell-free extracts of e mutants than in the wild-type. The mutants on minimal agar, and their sulphite reductase ity was the same as in the wild-type. Double ants deficient in both nitrite and sulfite reduc- s were constructed, as well as recominants h had regained one or both activities. The ina- to reduce sulfite was due to a genetic altera- (Little-Battelle)
-14450

AUTOMATION AT LOW COST,
tal Equipment Corp., Maynard, Mass. Lab. Products Group.
primary bibliographic entry see Field 07C.
-14451

V METHOD FOR EVALUATION OF DIS- VED OXYGEN PROBE RESPONSE FOR K L A DETERMINATION,
fornia Univ., Berkeley. Lawrence Berkeley

C. Wernau, and C. R. Wilke.
technology and Bioengineering, Vol 15, No 3, 1-578, May 1973. 3 fig, 15 ref.

criptors: Evaluation, *Methodology, Labora- equipment, Automation, Equations, Perm- ctive membranes, Dissolved oxygen, Re- ance, Instrumentation.
ntifiers: *Mass transfer coefficients, *Volu- ric liquid phase, *Dissolved oxygen probes, ope method, Response time, Slope (Mathe- ics), Accuracy.

Previously adopted methods for the measurement of the volumetric liquid phase mass transfer coefficient, K sub L a, in various liquid systems using dissolved oxygen probes have been problematic. The problems ranged from inability to define time in reference to step changes to the necessity of having very thin, highly permeable membranes in order to get accurate results. In order to alleviate such problems, a new method (the slope method) for finding K sub L a based on the transient response of dissolved oxygen probes was devised. Since the origin of time (time of the step change) is so poorly defined in actual experimental situations, measurement of the slope of the response curve (d (Et/Eo)/dt) would appear to be dependent upon the accurate estimation of the time of the step change. This problem is alleviated by taking the slope at its maximum value. This procedure is illustrated diagramatically. This method is independent of the time of the step change and is applicable for slow probes at K sub L a values from approximately 20/hr to values in excess of 500/hr. The method is least accurate at high K sub L a values, where the sensitivity of the slope to beta is considerably reduced. It is recommended that the method of Linek be used at K sub L a values below 20/hr and that faster probes than that used in this study be employed for K sub L a values above 500/hr. (Holoman-Battelle)
W73-14452

A PHOTON COUNTING DEVICE FOR THE MEASUREMENT OF NANOSECOND AND MICROSECOND KINETICS OF LIGHT EMISSION FROM BIOLOGICAL SYSTEMS,
MSU-AEC Plant Research Lab., East Lansing, Mich.
H. C. Beall, and A. Haug.
Analytical Biochemistry, Vol 53, No 1, p 98-107, May 1973. 2 fig, 18 ref.

Descriptors: *Photosynthesis, *Instrumentation, *Biochemistry, Scenedesmus, Laboratory equipment, Electronic equipment, Bioassay, Bioluminescence.
Identifiers: *Scenedesmus obliquus, *Photon counting, *Light emission, Lasers, Photomultipliers, Analog to digital converters.

Instrumentation and operation are described of a photon counting system which was constructed to measure the delayed light emission from the alga Scenedesmus obliquus. The study of the kinetics of the delayed light emission, especially the fast kinetics of the nanosecond and microsecond regions, should produce evidence concerning the mechanism involved in the early photochemical and biochemical steps of photosynthesis. The functioning of the system was illustrated by a plot which compared data of the recorded delayed light emission with data of the system noise over the first 20-microsecond interval after extinction of a modulated laser beam. The utility of photon counting as a satisfactory method of measuring biological light emission, especially a very rapid process such as the delayed light emission from photosynthetic organisms is illustrated. (Little-Battelle)
W73-14453

DETERMINATION OF ALUMINIUM BY ATOMIC ABSORPTION SPECTROPHOTOMETRY AFTER CHELATION WITH OXINE AND EXTRACTION WITH METHYL ISOBUTYL KETONE,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
B. H. Smith.
Laboratory Practice, Vol 22, No 2, p 100-102, February 1973. 5 fig, 7 ref.

Descriptors: *Aqueous solutions, *Aluminum, *Separation techniques, *Chelation, Water analysis, Iron, Fluorides, Phosphates, *Spectrophotometry.
Identifiers: *Atomic absorption spectrophotometry, Sample preparation, Chemical interference, Sensitivity, Precision, Detection limits, Oxalates, Citrates, Pyrophosphates, Orthophosphates.

Solutions of aluminum were prepared from A12 (SO4)3 (NH4)2 SO4.12H20 made up in HC1. Aliquots containing 0 to 100 micrograms of A1 were prepared by dilution with distilled water to give concentrations of 2 to 20 ppm A1. The samples were prepared for AA analysis by chelation of the A1 with oxine and extraction with methyl isobutyl ketone. The chelation step had the effect of concentrating the A1, thereby extending the range of usefulness of the method, and eliminating a number of interferences. A N20/C2H2 flame was used in the AA analysis with absorption measured at 30927 angstroms. The sensitivity of the method was approximately 0.3 ppm A1 per 1 percent absorption with a detection limit of approximately 0.2 ppm. Precision ranged from 3-20 percent depending on concentration of A1. Interferences and methods for eliminating them were studied by adding Fe (III), oxalate, fluoride, citrate, pyrophosphate, and orthophosphate. (Little-Battelle)
W73-14454

ISOLATION OF SALMONELLAE FROM PORK CARCASSES,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
J. A. Carpenter, J. G. Elliot, and A. E. Reynolds.
Applied Microbiology, Vol 25, No 5, p 731-734, May 1973. 3 tab, 26 ref.

Descriptors: *Pollutant identification, *Hogs, *Isolation, Enteric bacteria, Aerobic bacteria, Livestock, Mammals, Pollutants, Pathogenic bacteria, *Salmonella.
Identifiers: Salmonella derby, Salmonella anatum, Salmonella typhimurium, Salmonella indiana, Culturing techniques.

Four hundred and twenty pork carcasses from four abattoirs were examined for the presence of salmonellae by use of swabbing-enrichment techniques and contact plate methods. Carcasses from only one abattoir were found to be contaminated by swabbing-enrichment (23.3 percent) and contact plate (17.9 percent) methods. The area of the skin side of the ham, near the anal opening, was determined to be the area to examine for isolating salmonellae from pork carcasses with the greatest frequency. The most frequently isolated species of salmonellae in this study were Salmonella derby, S. anatum, S. typhimurium, and S. indiana. (Holoman-Battelle)
W73-14455

ABOLITION OF SWARMING OF PROTEUS BY P-NITROPHENYL GLYCERIN: APPLICATION TO BLOOD AGAR MEDIA,
Iowa State Univ., Ames. Dept. of Bacteriology.
F. D. Williams.
Applied Microbiology, Vol 25, No 5, p 751-754, May 1973. 2 tab, 5 ref.

Descriptors: *Inhibition, Inhibitors, Aerobic bacteria, Pathogenic bacteria, Cultures.
Identifiers: *Swarming, *Proteus, Culture media, Blood agar, p-Nitrophenyl glycerin, Plate counts, Comparative tests, Sodium azide, B-Phenylethanol, Bacterial physiology, Vibrio chloerae, Pseudomonas aeruginosa, Listeria monocytogenes, Klebsiella pneumoniae, Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus, Biochemical tests.

Comparative plate counts were made of Staphylococcus aureus and Streptococcus pyogenes growing on blood agar supplemented with individual chemicals to abolish the swarming of Proteus. B-phenylethanol, sodium azide, and p-

nitrophenyl glycerin (PNPG) were used as anti-swarm agents. Each anti-swarm agent effectively abolished swarming for 24 h, but azide failed to control swarming for longer periods of incubation. In addition, azide displayed growth inhibition towards the staphylococci and streptococci resulting in no hemolysis and reduced viable cell numbers with the streptococci. Phenylethanol showed reduced viable cell numbers with the streptococci and unreliable hemolytic reactions. At 0.1 to 0.3 mM, PNPG proved to be a superior anti-swarm agent in that it showed no growth inhibition and allowed normal hemolysis, but abolished swarming for extended periods of time. When laboratory strains of Streptococcus pneumoniae, Klebsiella pneumoniae, Pseudomonas aeruginosa, Listeria monocytogenes, and Vibrio cholerae were screened on a blood agar medium containing 0.1 mM PNPG they displayed similar growth and hemolytic characteristics to the identical medium without PNPG. (Holoman-Battelle)
W73-14456

A PRELIMINARY BASELINE STUDY OF ROBERTS AND STURGEON BANKS,
British Columbia Univ., Vancouver. Westwater Research Centre.
C. A. Bawden, W. A. Heath, and A. B. Norton.
Technical Report No. 1, March 1973. 54 p, 9 tab, 6 ref.

Descriptors: Environmental effects, *Mud flats, Animal populations, Wildlife, Pesticide residues, Sediments, Sampling, Deltas, Tidal marshes, Heavy metals, *Canada, *Baseline studies, *Aquatic population, *Data collections.
Identifiers: *Lower Fraser River (B.C.).

An extensive program covers biological, physical, and socio-economic aspects of the Lower Fraser River in British Columbia. Roberts and Sturgeon Banks are tidal flats in the Lower Fraser River delta. The purpose of the study was to determine the nature of the animal community of the Banks as of 1972. This included testing the larger animals for heavy metal and pesticide residues. Thirty-nine stations were sampled and 120 animals were tested. The data collected are presented on the type of species found, their relation to the grain size of sediment that they were found in, and their heavy metal and pesticide content. The study is intended to serve as a baseline for future studies of changes that may take place due to urban development and lower levels of water quality. It was found that the mudflats and estuarine area are not showing any signs of eutrophication. (Elfers-North Carolina)
W73-14486

A PRELIMINARY WATER QUALITY SURVEY OF THE LOWER FRASER RIVER SYSTEM,
British Columbia Univ., Vancouver. Westwater Research Centre.
A. H. Benedict, K. J. Hall, and F. A. Koch.
Technical Report No. 2. April 1973. 50 p, 2 fig, 9 tab, 1 append.

Descriptors: *Water quality, *Water analysis, *Data collections, Sampling, Sediments, Streamflow, *Canada.
Identifiers: *Lower Fraser River (B.C.).

The Lower Fraser River and tributaries comprising a drainage basin area of 78,300 square miles, covers most of the Interior Plateau of British Columbia. Spring floods from melting snows create the basin's runoff. The flat gradient of the river in the valley below the Coast Mountains results in water levels and discharge rates being affected by tides as far up as Chilliwack some 60 miles from the river mouth. The Lower Fraser is regarded at present as a clean stream but rapid development of the Province could seriously degrade its water quality. The report has three basic objectives: (1) to assemble and collate all available data on water quality in the river system from past studies; (2) to provide a broad overview of the existing water quality in the entire system; and (3) to begin to use these data to identify the best approach for developing a means to predict future water quality levels. Several tables of data collected include a summary of data prior to 1972, and various data collected in the summer of 1972 for both the Lower Fraser and several tributaries. Two key findings were that water quality in the tributaries is poorer than in the main stem and that there is no significant difference in quality between earlier data and the 1972 data. (Elfers-North Carolina)
W73-14487

ANALYSIS OF ORGANIC SALTS BY LASER IONIZATION MASS SPECTROMETRY: SULFONATES, SULFATES AND THIOSULFATES,
Pennsylvania State Univ., University Park. Dept. of Entomology.
R. O. Mumma, and F. J. Vastola.
Organic Mass Spectrometry, Vol 6, p 1373-1376, 1972. 1 tab, 7 ref.

Descriptors: *Chemical analysis, *Sulfates, *Sulfonates, *Mass spectrometry, Analytical techniques, Organic compounds, Water pollution sources, Pollutant identification, Sewage effluents, Detergents.
Identifiers: *Organic salts.

Sodium and potassium salts of organic sulfonates (1-decyl, 1-dodecyl and 1-hexadecyl), sulfates (1-hexyl, 1-decyl and 1-octadecyl) and thiosulfates (1-octyl, 1-dodecyl, 1-tetradecyl, 1-hexadecyl, benzyl and beta-phenylethyl) were ionized by laser irradiation and the positive ions were analyzed by time-of-flight mass spectrometry. The laser ionization mass spectra of the sodium salts of three alkyl sulfonates (1-decyl, 1-dodecyl and 1-hexadecyl) are tabulated. These salts, ranging in molecular weight from 244 to 328, produced simple intense spectra as did the 1-hexyl-sulfonates. The molecular species plus a cation (M+Na) is always the most intense ion in the spectra. Other organic ions are observed because of the dimers plus a cation. Inorganic ions (Na2SO3)+, (Na3SO3)+ and (Na3SO4)+) of low relative intensity are produced in approximately equal abundance. The spectra of sodium sulfates (1-hexyl and 1-decyl) and potassium 1-octadecyl sulfate are also presented. These spectra are more complex than the spectra of the sulfonates. A number of the sodium thiosulfate salts possessed ions containing potassium. The sodium salts were not cleanly prepared by ion exchange chromatography and possesed small amounts of potassium ions. Potassium is more easily ionized than sodium and therefore small amounts of potassium ions are easily observed in sodium salts. (Woodard-USGS)
W73-14546

RADIOCHEMICAL STUDIES ON EFFECT OF BATH: I. DETERMINATION OF MERCURY IN SPRING MUD BY NEUTRON ACTIVATION ANALYSIS (IN JAPANESE),
Kyushu Univ., Beppu (Japan). Inst. of Balneotherapeutical Research I.
H. Kawamura, and H. Kawakami.
J Hyg Chem, Vol 17, No 4, p 284-286, 1971, English summary.
Identifiers: Bath, Excretion, *Japan (Beppu spa), *Mercury, Mud, *Neutron activation analysis, Radiochemical analysis, Springs, Toxicosis.

Following radiochemical analysis of microamounts of mercury in hot spring water in 45 places in Beppu spa, mercury content in dried sludge and solution was determined by radiochemical analysis with Kon-ya S sludge. The content of mercury in the S sludge was 15.4 ppm in dried sludge and more than 14.6 microgram/liter of mercury is in liquid state in the natural hydrated sludge (liquation rate, 9.5%). This result indicates that mercury present is much greater than that in other soils or in spa water. (Copyright 1973, Biological Abstracts, Inc)
W73-14661

5B. Sources of Pollution

THE LIMNOLOGY OF TWO DISSIMILAR SUBARCTIC STREAMS AND IMPLICATIONS OF RESOURCE DEVELOPMENT,
Alaska Univ., College. Inst of Water Resources
J. D. LaPerriere, and D. Nyquist
Available from the National Technical Information Service as PB-223 353, $3.75 in paper copy, $1.45 in microfiche. Report No. IWR-33. March, 1973. 73 p, 21 fig, 10 tab, 3 append. OWRR B-017-ALAS (1).

Descriptors: Streams, *Nutrients, Physical properties, Chemical properties, *Benthos, Aquatic drift, *Dissolved oxygen, *Alaska, Subarctic, Mayflies, Coddisflies, Diptera, Biochemical oxygen demand, *Invertebrates.
Identifiers: Goldstream Creek (Alas), Chatanika River (Alas).

The Chatanika River and Goldstream Creek, two subarctic streams which lie in roughly parallel valleys in interior Alaska, but that differ in size of watershed, elevation, geomorphology and vegetation were studied over an eighteen month period. Both streams are currently free of human manipulation. Various chemical and physical parameters were measured approximately monthly for fourteen months at nine stations on the Chatanika River and five stations along Goldstream Creek. The benthic macroinvertebrate organisms were studied to elucidate relationships between selected parameters and their appearance in drift and Surber samples. A strong time dependance overshadowed all other relationships. The occurrences of specific macroinvertebrates in each stream and of the species diversity of each sample are presented. The dissolved oxygen regime of these two streams was also studied. Dissolved oxygen data taken approximately bimonthly are presented as are tables of biochemical oxygen demand in which samples were incubated both at 5C and 20C.
W73-14203

SELECTED PESTICIDES IN AQUATIC FUNGI IN THE THREE RIVERS AREA,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-14207

ROUND HORIZONTAL THERMAL-BUOYANT JET IN A CROSS FLOW,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. E. Nece, and J. D. Littler.
Available from the National Technical Information Service as PB-223 376, $3.50 in paper copy, $1.45 in microfiche. Technical Report No. 34, June 1973. 55 p, 30 fig, 13 ref, append. OWRR A-056-WASH (1).

Descriptors: *Thermal pollution, *Jets, Diffusion, Hydrodynamics, Flow, Temperature, Velocity, Water temperature, *Flow rates, Froude number, *Boundary processes.
Identifiers: *Cross flow, *Buoyant jets.

Results are presented for an experimental study of round buoyant jets discharged horizontally into and at right angles to the direction of flow of an unstratified receiving stream. Objectives were to obtain empirical relationships defining the trajectory and near field temperature distribution of such jets. Experimental results are given in the form of dimensionless jet trajectories and center-

line temperature elevation above that of the receiving fluid. Experimental data were obtained for jet densimetric Froude numbers (as conventionally defined) of 5, 10, and 15, combined with jet discharge/cross flow velocity ratios of 0.5, 1, 5, and 10. The velocity ratio was far more significant in determining the jet behavior than was the densimetric Froude number. Velocity ratios and Froude numbers tested span ranges commonly encountered in outfall designs. Experimental parameters, including boundary conditions with the jet being discharged from a circular outfall located close to the bottom of the receiving channel, were intended to be representative of simplified approximations of a single-outfall cooling water discharge from a thermal plant located on a river. Effects of the near proximity of the channel bottom and of the small channel depth/jet diameter ratio of 4 were clearly evident in comparison of the results with those of previous cases of jets discharged into cross flows.
W73-14212

PREDICTING AND CONTROLLING RESIDUAL CHLORINE IN COOLING TOWER BLOWDOWN,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg. National Thermal Pollution Research Program.
For primary bibliographic entry see Field 05D.
W73-14215

POLLUTION FROM ANIMAL FEEDLOTS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
R. I. Lipper.
Kansas Water Resources Research Institute, Manhattan, Project Completion Report, Contribution No. 121, May 1973. 19 p, 17 fig, 15 tab, 28 ref. OWRR A-008-KAN (1). 14-01-0001-786.

Descriptors: *Feedlots, *Water pollution sources, Runoff, Hydrology, *Farm wastes, *Rainfall simulators, Chemical oxygen demand, Biochemical oxygen demand, Nitrogen compounds, Bacteria, Solid wastes, Water pollution control.
Identifiers: *Beef animals, Characterization.

Two test feedlots, each with an area of 0.05 acre were stocked with beef animals on a finishing ration at a rate of 200 animals per acre (10 steers per test lot). One feedlot was entirely surfaced with concrete, the other only at feedbunk and waterer. Slope was 2 percent. Rainfall was simulated by sprinklers capable of application rates from 0.4 to 2.5 in. per hour. Runoff was measured and sampled. Runoff rate and volume were compared to application rate and volume. Concentrations of BOD, COD, nitrogen compounds, solids, and bacteria were determined. The effects of certain management practices on runoff characteristics were observed.
W73-14227

RELATIONSHIP BETWEEN EXTRACELLULAR AND CELLULAR PRODUCTION IN THE SULPHURIC GREEN BACTERIUM CHLOROBIUM LIMICOLA NADS. (CHLOROBACTERIACEAE) AS COMPARED TO PRIMARY PRODUCTION OF PHYTOPLANKTON,
Bialystok Medical Academy (Poland). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-14245

UPTAKE OF RADIONUCLIDES BY SOME AQUATIC MACROPHYTES OF ISMAILIA CANAL, EGYPT,
Atomic Energy Establishment, Cairo (Egypt). Radiation Protection Dept.
For primary bibliographic entry see Field 05C.
W73-14247

NITROGEN AND PHOSPHORUS IN A STRETCH OF THE GUADALUPE RIVER, TEXAS, WITH FIVE MAIN-STREAM IMPOUNDMENTS,
Southwest Texas State Univ., San Marcos.
H. H. Hannan, W. C. Young, and J. J. Mayhew.
Hydrobiologia, Vol 41, No 3, p 419-441, May 15, 1973. 9 fig, 4 tab, 32 ref.

Descriptors: *Nitrogen, *Phosphorus, Pollutant identification, *Reservoir storage, *Texas, *Nutrients, *Water analysis, Water pollution sources, Water pollution effects, Sewage effluents, Water sampling, Chemical analysis, Industrial wastes, Pollutant identification, Fluctuations, Impoundments, Nitrates, Nitrites, Ammonia, Phosphates, Outlets, Treatment facilities, Plant growth, Phytoplankton, Methodology, Cycling nutrients.
Identifiers: *Guadalupe River (Tex), *Seasonal variation, Kjeldahl nitrogen, Organic phosphorus, Chlorophyll a, Comal River, Nuphar, Philodendron, Lake Gonzales, Eichornia crassipes, Lake Wood, Meadow Lake, Lake McQueeney, Lake Dunlap, Ludwigia, Dissolved nitrogen, Dissolved phosphorus.

Nitrogen and phosphorus were studied in a 168-km stretch of the Guadalupe River that had five mainstream impoundments. Flow through the study area was controlled by releases from these five reservoirs and from Canyon Reservoir, a deep-storage reservoir, located 30 km upstream. Parameters measured monthly on a diel basis at 16 stations were nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, Kjeldahl nitrogen, inorganic phosphate phosphorus, organic phosphate phosphorus, and total phosphate phosphorus. Inorganic nitrogen concentrations observed were as high or higher than that previously reported for other bodies of water. Nitrate nitrogen, in general, reached seasonal minima in summer and maxima in winter. Nitrite nitrogen showed considerable variation with no meaningful pattern except that higher concentrations occurred in association with high chlorophyll a and high Kjeldahl nitrogen, regions and periods of low river flow, and large phytoplankton populations. There was no increase in concentration of any form of nitrogen in the vicinity of sewage outfalls and no downstream accrual. Phosphorus levels in the study area were as high or higher than those reported in studies of other bodies of water. Total phosphate phosphorus was the most critical phosphate parameter in assessing eutrophication. Seasonally, it ranged from a winter high to a summer low. Concentrations were highest immediately below sewage outfalls and decreased as water progressed downstream. Inorganic-phosphate-phosphorus concentrations showed no clear seasonal trend but were clearly associated with sewage outfalls. Total organic phosphate phosphorus varied seasonally, with high concentrations occurring during the spring and low concentrations in the fall, showed no correlation with sewage outfalls, but was correlated to a degree with total Kjeldahl nitrogen and chlorophyll a. No consistent pattern of diel fluctuations was evident for any phosphorus or nitrogen compounds analyzed. (Holoman-Battelle)
W73-14249

THE LIMNOLOGY OF NITROGEN IN AN OKLAHOMA RESERVOIR: NITROGENASE ACTIVITY AND RELATED LIMNOLOGICAL FACTORS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-14253

THE ENVIRONMENTAL TOXICITY OF CRASSIN ACETATE USING TETRAHYMENA PYRIFORMIS AS A MODEL,
Oklahoma Univ., Norman. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-14255

MICROBIOLOGY OF WATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
E. E. Geldreich.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1244-1259, June 1973. 108 ref.

Descriptors: *Bibliographies, *Bioindicators, *Bacteria, *Water quality, *Waste water (Pollution), *Reviews, Rivers, Coliforms, Mercury, Domestic wastes, Industrial wastes, Heavy metals, Estuaries, Lakes, Ponds, Sea water, Streptococcus, E. coli, Vegetable crops, Tracers, Feed lots, Agricultural runoff, Salmonella, Chlorides, Yeasts, Salinity, Population, Algae, Water temperature, Bicarbonates, Phosphates, Sulfates, Nitrogen fixation, Sediments, Acid mine water, Radioactivity techniques, Dissolved oxygen, Ammonia, Nitrites, Nitrates, Phytoplankton, Stratification, Hydrogen ion concentration, Rain, Organic matter, Sampling, Equipment, Microbial degradation, Aldrin, DDT, Water pollution effects, Manganese, Potable water, Reservoirs, Cycling nutrients, Monitoring, Groundwater, Viruses, Oil, Oil pollution, Isolation, Chlamydomonas, Clostridium.
Identifiers: Culture media, Differential media, Membrane filters, Most probable number test, Fecal coliforms, Nile River, Ismolia Canal, Fecal pollution, Edwardsiella tarda, Fecal streptococci, Streptococcus bovis, Streptococcus faecium var. casseliflavus, Aeromonas hydrophila, Streptococcus equinus, Streptococcus avium, Pseudomonas aeruginosa, Staphylococcus aureus, Bacillus, Serratia marcescens, Chemoluminescence, Aerobacter aerogenes, Fluorescence spectrophotometry, Shigella dysenteriae, Rhodotorula glutinis, Bdellovibrio bacteriovorous, Vexillixera, Agarbacterium, Pythium debaryanum, Salmonella typhosa, Pseudomonas acidophilia, Thiobacillus ferrooxidans, Sugars, Particulate matter, Gallionella ferruginea, Saprolegniaceae, Aerobacter aerogenes, Pseudomonas fluorescens, Aeromonas, Comomonas, Herellea, Flavobacter, Enterobacter, Klebsiella, Clostridium perfringens, E. coli communae, E. coli citrovorum, Acinetobacter, Achromobacter, Flavobacterium, Xanthomonas, Chromobacterium, Alcali.

Literature from 1972 concerning microbiological methods for water and wastes is reviewed. Topics include culture media, adequacy of methods for detecting fecal pollution, microbiological indicators for mercury, use of microorganisms for tracing water movement, rapid methods for determining bacterial quality of water, and microbiology of rivers, lakes, ponds, reservoirs, potable water, estuaries, and coastal waters as influenced by various types of pollution. (Little-Battelle)
W73-14260

MICROBIOLOGY - WATERBORNE OUTBREAKS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05C.
W73-14262

MICROBIOLOGY-DETECTION OF BACTERIAL PATHOGENS AND THEIR OCCURRENCE,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-14263

MICROBIOLOGY-DETECTION AND OCCURRENCE OF VIRUSES,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-14264

AQUATIC SEDIMENTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05C.

W73-14265

MARINE AND ESTUARINE POLLUTION,
California State Univ., Long Beach. Dept. of Biology.
D. J. Reish.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1310-1319, June 1973. 125 ref.

Descriptors: *Water pollution, *Water pollution effects, *Estuarine environment, *Reviews, Oil pollution, Sea wter, Invertebrates, Marine algae, *Bibliographies, Bioindicators, Water quality, Waste water (Pollution), Industrial wastes, Thermal pollution, Path of pollutants, Water pollution sources, Red tide, Phytoplankton, Oil spills, Toxicity, Esturaries, Heavy metals, Protozoa.
Identifiers: *Marine environment, Macroinve, Foraminiferartebrates, Bay of Conception, Chemical oceanography, Physical oceanography, Polychaetes, Enteromorpha, Spiochaetopterus.

Topics discussed in this literature review of marine and estuarine pollution are: bioindicators, thermal pollution; toxicity and pathology; oil pollution; biological and chemical effects (bioassays); bioaccumulation; pathogenic bacteria; chemical analyses of organisms for pollutants; and physical and chemical oceanography. (Holoman-Battelle)
W73-14266

HEAVY METALS: A REVIEW OF LEAD,
Illinois Univ., Urbana.
S. S. Shukla, and H. V. Leland.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1319-1331, June 1973. 118 ref.

Descriptors: *Lead, *Toxicity, *Path of pollutants, *Water pollution effects, *Bibliographies, *Water pollution sources, Animal pathology, Ecological distribution, Public health, Waste water (Pollution), Soil contamination, *Heavy metals, Air pollution, Water pollution, Great Lakes, Ice cover, Insecticides, Pesticide drift, Arsenicals (Pesticides), Pollutants, Atmosphere, Aerosols, Highways, Rainfall, Urban runoff, Storm runoff, Industrial wastes, Surface drainage, Lake Erie, Lake Michigan, Lake Ontario, Freshwater, Lakes, Streams, Organic matter, Bottom sediments, Lake sediments, Freshwater fish, Marine fish, Zooplankton, Marine animals, Phaeophyta, Marine algae, Aquatic algae, Lake Superior, Igneous rocks, Metamorphic rocks, Leaching, Sedimentary rocks, Sediment-water interfaces, Waste disposal, Chemical wastes, Surface runoff, Gasoline, Reviews.
Identifiers: Pollutant effects, Chemical concentration, Metal complexes, Biological magnification, Dissolved organic matter, Lithosphere, Hydrosphere, Anodic stripping voltammetry, Particulate matter.

This literature review on lead covers toxicity and sources of lead pollution along with the concentrations associated with each source. (Holoman-Battelle)
W73-14267

THERMAL EFFECTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W73-14268

EUTROPHICATION,
New York State Dept. of Environmental Conservation, Stony Brook.
For primary bibliographic entry see Field 05C.
W73-14269

ASBESTOS FIBERS IN BEVERAGES, DRINKING WATER, AND TISSUES: THEIR PASSAGE THROUGH THE INTESTINAL WALL AND MOVEMENT THROUGH THE BODY,
Department of National Health and Welfare, Ottawa (Ontario). Food and Drug Research Lab.
For primary bibliographic entry see Field 05A.
W73-14275

POLYCHLORINATED TERPHENYLS AS POTENTIAL CONTAMINANTS OF ANIMAL PRODUCTS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 05A.
W73-14277

THE GENERAL CIRCULATION OF WATER IN LAKE CHAD,
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad),
For primary bibliographic entry see Field 02H.
W73-14279

SOURCES AND SINKS OF NITROGEN AND PHOSPHORUS: WATER QUALITY MANAGEMENT OF LAKE GEORGE (N.Y),
Rensselaer Polytechnic Inst., Troy, N.Y.
D. B. Aulenbach, and N. L. Clesceri.
In: Water-1972, AICHE Symposium Series No 129, Vol 69, p 253-262, 1973. 1 fig, 3 tab, 21 ref.

Descriptors: *Phosphorus, *Nitrogen, *Sinks, *Water pollution sources, Precipitation (Atmospheric), Waste water (Pollution), Streamflow, Sewage effluents, Path of pollutants, Nutrients, Water quality control, Chemical precipitation, Trophic level, Oligotrophy, Mesotrophy, Bottom sediments, Lake morphology, Discharge (Water), Runoff, Lake sediments, Surface waters, *New York.
Identifiers: *Lake George (NY), *Nutrient sources, Fate of pollutants, Accumulation.

Measurements were made of the nitrogen and phosphorus contents of the precipitation, stream runoff, and wastewater discharges tributary to Lake George; the lake water itself; and the equivalent of the outlet at Ticonderoga. The major source of nitrogen to the lake is the precipitation which falls directly on the lake. The major source of phosphorus is from wastewater discharges on the watershed. Apparently both the nitrogen and the phosphorus are precipitated and accumulated in the bottom sediments. The concentration of phosphorus in the lake is approaching the critical level of 10 micrograms/l. Removal of phosphorus from wastewater is recommended. (Holoman-Battelle)
W73-14284

PRELIMINARY SURVEY OF MERCURY AND OTHER METALS CONTAINED IN ANIMALS FROM THE FRASER RIVER MUDELATS,
British Columbia, Univ., Vancouver. Inst. of Oceanography.
T. R. Parsons, C. A. Bawden, and W. A. Heath.
Journal of the Fisheries Research Board of Canada, Vol 30, No 7, p 1014-1016, July 1973. 1 tab, 2 ref.

Descriptors: *Heavy metals, *Chemical analysis, Estuarine environment, Water pollution sources, *Benthic fauna, *Pollutant identification, Crabs, *Mercury, Estuaries, Cadmium, Cobalt, Copper, Manganese, Nickel, Zinc, Lead, Colorimetry, Oysters, Marine animals, Mussels, Biological communities, *Canada.
Identifiers: *Fraser River estuary, *Animal tissues, Bioaccumulation, Sample preparation, Silver, Flameless atomic absorption spectrophotometry, Atomic absorption spectrophotometry, Cancer magister, Cowichan Bay, Kitimat Arm, Mya arenaria, Crassostrea gigas.

Additional research has been directed toward answering the question of the source of mercury contamination in the Fraser River estuary. The Fraser River mudflat community was divided into two areas from which crabs were collected for Hg analysis. Crabs and other marine organisms were also collected from other areas for comparative analyses. Soft tissse was freeze-dried, powdered, digested with concentrated HNO_3, evaporated to dryness, diluted with 1.5 M HCl, and analyzed by atomic absorption spectrophotometry for Ag, Cd, Co, Cu, Mn, Ni, and Zn. Pb analysis was done colorimetrically and Hg was analyzed by flameless AAS after sample digestion using sulfuric acid and hydrogen peroxide. Benthic animals from Sturgeon Bank contained larger amounts of mercury and other metals than animals from similar environments on the coast of British Columbia. These high levels of metals are believed to be associated with the Vancouver City sewer outfall. (Holoman-Battelle)
W73-14293

DISCHARGE OF NITRILOTRIACETATE (NTA) FROM TWO SEWAGE TREATMENT FACILITIES LOCATED IN A MIDCONTINENTAL CLIMATE,
Fisheries Reasearch Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. W. M. Rudd, B. E. Townsend, and R. D. Hamilton.
Journal of the Fisheries Research Board of Canada, Vol 30, No 7, p 1026-1030, July 1973. 2 fig, 2 tab, 10 ref.

Descriptors: *Nitrilotriacetic acid, Treatment facilities, *Sewage effluents, *Aerated lagoons, *Activated sludge, *Discharge measurement, Sewage treatment, Water pollution sources, Biochemical oxygen demand, Effluent streams, Influent streams, Dissolved oxygen, Pollutants, Pollutant identification, *Canada.
Identifiers: *Degradation rates, Red River, Assiniboine River, Chemical concentration.

Concentrations of NTA entering the Red and Assiniboine rivers from two Winnipeg sewage treatment facilities were monitored. The activated sludge plant usually discharged less than 0.5-mg NTA/liter throughout the year. The aerated sewage lagoon discharged less than 20 micrograms NTA/liter during summer. It was believed that the NTA passed through the lagoon essentially unchanged during winter (1800 micrograms NTA/liter) when degradation rates must have been extremely low. No NTA was detected in river water downstream from either of these facilities. It was concluded that even under extreme environmental conditions NTA discharge did not present a hazard to either local aquifers or local biota. (Holoman-Bettelle)
W73-14294

SELECTED METALS IN SEDIMENTS, WATER, AND BIOTA IN THE ILLINOIS RIVER,
Bradley Univ., Peoria, Ill. Dept. of Biology.
B. J. Mathis, and T. F. Cummings.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1573-1583, July 1973. 3 fig, 7 tab, 20 ref. OWRR A-034-ILL (2).

Descriptors: *Heavy metals, *Bottom sediments, *Tubificids, Clams, Freshwater fish, *Water pollution, *Pollutant identification, Chemical analysis, Absorption, Benthic fauna, Cadmium, Chromium, Cobalt, Copper, Lead, Nickel, Zinc, Water analysis, Oligochaetes, Annelids, Mud-water interfaces, Water pollution effects, Water sampling, Laboratory tests, Aquatic animals, White bass, Carp, Carnivores, Omnivores, Mollusks, Path of pollutants.
Identifiers: *Illinois River, Sample preparation, Atomic absorption spectrophotometry, Bioaccumulation, Lithium, Dorosoma cepedianum, Animal tissues, Esox lucius, Largemouth bass,

mallmouth bass, Fate of pollutants, Northern ike, Fingernail clam.

his study was designed to assess the degree of etal contamination in a large midwestern river. he river is utilized both by industries for manuacturing and waste disposal purposes and by ciies as a source of potable water and a means of astewater disposal. Analyses were made for opper, nickel, lead, chromium, lithium, zinc, obalt, and cadmium in bottom sediments, water, ibificid annelids, clams, and fishes. Metal conentrations were higher in sediments than in water id organisms. Clams and worms that inhabit the ud or mud-water interface exhibited the highest etal concentrations of any of the organisms. ishes that are primarily carnivorous in nature exbited lower mean muscle concentrations of opper, nickel, lead, chromium, zinc, and cadmin than did omnivorous fishes. (Holoman-Battelle)
/73-14308

IOLYBDENUM CONCENTRATIONS IN TISUES OF RAINBOW TROUT (SALMO GAIRDERI) AND KOKANEE SALMON (ONCORYNCHUS NERKA) FROM WATERS DIFFERNG WIDELY IN MOLYBDENUM CONTENT,
olorado Univ., Boulder. Dept. of Environmental, opulation, and Organismic Biology.
V. Ward.
ournal of the Fisheries Research Board of anada, Vol 30, No 6, p 841-842, June 1973. 1 tab, ref.

Descriptors: *Water analysis, *Molybdenum, Rainbow trout, X-ray fluorescence, Specrophotometry, Absorption, Heavy metals, Reseroirs, Sockeye salmon.
Identifiers: *Biological samples, *Bioaccumulaon, *Kokanee salmon, Liver, Kidneys, Testes, Tissue, Ovaries, Spleen, Bone, Muscle, Intestine, tomach, Brain, Fat, Gills, Salmo gairdneri, Onorhynchus nerka.

almo gairdneri and Oncorhynchus nerka were obained from Dillon and Eleven Mile Reservoirs and hatchery in Colorado for analysis of molybenum content. Liver, kidney, testes, ovaries, pleen, bone, muscle, intestine, stomach, brain, at, and gill samples were analyzed by x-ray luorescence. Water samples were analyzed specrophotometrically. Concentrations of molybenum in tissues of rainbow trout increased only lightly with increase in molybdenum concentraion of the water. Fish from high (300 ppb) molybenum water had mean concentrations of 13-332 pb on a wet-weight basis; those from low (6 ppb) nolybdenum water, 10-146 ppb; and those from race molybdenum water, 5-118 ppb. Rainbow rout exhibited generally higher molybdenum conentrations than did kokanee salmon in high nolybdenum water. A possible plateau mechanism oncerning molybdenum accumulation by salnonids is discussed. (Little-Battelle)
W73-14309

SUMMER ALGAL COMMUNITIES AND PRIMARY PRODUCTIVITY IN FISH PONDS,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 05C.
W73-14315

DETERGENTS,
Matz, Childs, and Associates, Baltimore, Md.
S. K. Banerji.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1059-1063, June 1973. 23 ref.

Descriptors: *Detergents, *Waste water treatment, *Reviews, *Bibliographies, Water pollution effects, Water pollution sources, *Surfactants, Biodegradation, Nutrient removal, Environmental effects, Nitrilotriacetic acid, Water pollution, Toxicity, E. coli, Lethal limit, Bioassay, Temperature, Water quality, Linear alkylate sulfonates, Groundwater, Carbonates, Phosphates, Laboratory tests, Striped bass, Microbial degradation, Waste water (Pollution), Domestic wastes, Industrial wastes.
Identifiers: Detergent-builders, Fate of pollutants, Quahog, Mercenaria mercenaria, Grass shrimp, Palaemonetes vulgaris, Histopathology, Sandworms, Anionic detergents, Anionic surfactants, Porgies, Degradation products, Dodecylsulfate, Dodecylbenzene sulfonate, Methylene blue active substance, Pinus sylvestris, Hermit crabs, Munnichogs, Scups.

This literature review on detergents is concerned with the (1) detergent builders - their toxicity, impact on water quality, and biodegradation; (2) anionic surfactant concentrations and biodegradation; and (3) the removal of surfactants from wastewater. (Holoman-Battelle)
W73-14319

WATER QUALITY MONITORING ON THE MISSISSIPPI RIVER HAS ITS PITFALLS,
Saint Louis Metropolitan Sewer District, Mo.
B. A. Rains, and R. S. Flick.
In: Water-1972, AIChE Symposium Series No. 129, Vol 69, p 401-413, 1973. 11 fig, 4 tab.

Descriptors: *Water quality, *Monitoring, Natural streams, *Water pollution sources, *Water sampling, Equipment, *Methodology, Environmental effects, Flow measurement, *Mississippi River, Chemical analysis, Water analysis, Waves (Water), Phenols, On-site data collections, Discharge (Water), River flow, Water temperature, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Suspended solids, Annual, Pollutant identification.
Identifiers: Biological samples, Fecal coliforms.

The difficulties and problems associated with sampling a large stream such as the Mississippi River to determine biological and chemical quality are discussed. Included is information on sampling point selection, methods of sample collection, flow measurement technique, and pollution source location. Field equipment and laboratory results obtained from sample analysis are described. (Holoman-Battelle)
W73-14320

THE METABOLISM OF LONG-CHAIN FATTY ACIDS AND ALCOHOLS BY CANDIDA TROPICALIS AND SACCHAROMYCES CEREVISIAE,
For primary bibliographic entry see Field 05C.
W73-14325

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 07B.
W73-14354

ECOLOGICAL EVALUATION OF MULTIUSE WATERS RECEIVING PRIMARY TREATMENT EFFLUENT PRIOR TO A MAJOR FLOW INCREASE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-14361

THE COMPUTER-SYSTEMS APPROACH TO ENVIRONMENTAL PROTECTION, PLANNING AND MANAGEMENT: THE MALIBU WATERSHED,
California Univ., Los Angeles. School of Public Health.
E. S. Flowers, and D. May.
Available from the National Technical Information Service as PB-223 559, $4.25 in paper copy, $1.45 in microfiche. Water Resources Center, University of California, Davis, Contribution No. 136, December, 1971. 113 p, 11 fig, 197 ref, 2 append. OWRR A-038-CAL (2). UCAL-WRC-W-330.

Descriptors: *Computer models, *Systems analysis, Environmental control, *Water quality, *California, *Model studies.
Identifiers: *Malibu watershed (Calif).

Computer models are described in hydrology, water quality, ecology, behavioral systems, and data management prepared as a part of a multidisciplinary project studying the environment of the Malibu watershed. Over one hundred models have been selected and described from the literature, and possible applications of the models to the protection, planning and management of the Malibu watershed are discussed in terms of an environmental systems approach. The objective has been to describe computer methods, techniques, software, and possible application of computer systems to general environmental systems with emphasis on the water resource.
W73-14371

EFFECT OF SILT AND SILT REMOVAL IN A PRAIRIE LAKE,
Dakota State Coll., Madison, S. Dak. Dept. Biology; and Dakota State Coll., Madison, S. Dak. Dept. of Chemistry.
For primary bibliographic entry see Field 05C.
W73-14373

RESPONSE OF SALINITY SENSORS TO RAPIDLY CHANGING SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W73-14417

DIERNAL SOIL-WATER EVAPORATION: CHLORIDE MOVEMENT AND ACCUMULATION NEAR THE SOIL SURFACE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02D.
W73-14422

PRODUCTION, POLLUTION, PROTECTION,
W. B. Yapp.
Wykeham Publication, Ltd: London, England; Springerverlag: New York, N,Y,, 1972. 181 p Illus, Maps, Paper, Pr $5.80.
Identifiers: Animals, Books, Food chains, Land use, Pesticides, *Pollution, *Production, Protection, Radiation, *Water pollution control, Water pollution sources.

Whole-organism biology, as opposed to specialized aspects of biology, such as molecular biology, is discussed. How organic matter is made and converted from one form to another is discussed. Topics such as synthesis and food chains, primary production, conversion, definitions and practical methods, the factors of production and the biotic factors of production are all discussed. A discussion on how man has, deliberately or accidentally, interfered with the natural flow of production is presented. Grazing, destruction of animals, cultivation of crops, cropping of animals and land use are considered. How man has polluted the environment is stressed. Terrestrial pollution, atmospheric pollution, organic matter, pollution of the sea, pesticides and radioactive wastes are discussed. The possible ways in which man may protect himself from mismanagement of nature's resources are presented.--Copyright 1973, Biological Abstracts, Inc.
W73-14430

EXAMINATION OF ULTRASTRUCTURE AND GROWTH OF THE CELL WALL OF SPYRIDIA FILAMENTOSA (WULF.) HARV., UNTERSUCHUNGEN UBER BAU UND WACHSTUM DER ZELLWANDE VON SPYRIDIA FILAMENTOSA (WULF.) HARV.),
Thessaloniki Univ., Salonika (Greece). Botanical Inst.
For primary bibliographic entry see Field 05C.
W73-14439

DETRITUS IN LAKE TAHOE: STRUCTURAL MODIFICATION BY ATTACHED MICROFLORA,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W73-14445

DEEP-SEA MICROORGANISMS: IN SITU RESPONSE TO NUTRIENT ENRICHMENT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-14446

NITRITE REDUCTASE-DEFICIENT MUTANTS OF ESCHERICHIA COLI K12,
Birminham Univ. (England). Dept. of Biochemistry.
For primary bibliographic entry see Field 05A.
W73-14450

WASTE DISPOSAL IN NATURAL WATERWAYS,
Harvard Univ., Cambridge, Mass. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W73-14458

PLANT PHENOLS AND RELATED ORGANIC COMPOUNDS IN PUBLIC WATER SOURCES, THEIR RELATIONSHIP TO CHLORINATION,
Rhode Island Univ., Kingston. Dept. of Pharmacology.
Y. Shimizu.
Available from the National Technical Information Service as PB-223 566, $2.75 in paper copy, $1.45 in microfiche. Rhode Island Water Resources Center Final Report, 1973. 12 p, 4 tab. OWRR A-041-RI (1). 14-31-0001-3840.

Descriptors: *Phenols, *Chlorination, *Toxicity, Water supply, *Organic compounds, *Amino acids, Water pollution sources, Water pollution effects.

In the investigation of interaction between organic pollutants and active chlorine in water, hydroxycinnamic acids were found to afford various chlorinated styrene and chlorinated quinone derivatives. Phenolic amino acids tyrosine gave chlorinated benzyl acetonitrile derivatives. Furthermore, it was discovered that, in general, free amino acids afford nitrile derivatives even in a very high dilution. To evaluate the possible effects of the products to human and ecological systems, antimicrobial, molluscicidal activities and acute toxicities to mice were investigated. In each case, mild activity was observed with most of the compounds.
W73-14468

INTERCEPTION AND DEGRADATION OF PESTICIDES BY AQUATIC ALGAE,
Rhode Island Univ., Kingston. Dept. of Pharmacology.
For primary bibliographic entry see Field 05C.
W73-14469

CANADARAGO LAKE EUTROPHICATION: PHOSPHORUS ALONG A SECTION OF OCQUIONIS CREEK,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05C.
W73-14537

HISTORY OF THE SOUTH CAROLINA OYSTER,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Center.
For primary bibliographic entry see Field 02L.
W73-14589

LOUISIANA SUPERPORT STUDIES--REPORT 2, PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF A SUPERPORT ON THE SOUTHEASTERN COASTAL AREA OF LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
J. H. Stone.
Available from NTIS, Springfield, Va. 22151 as COM-73-10544, Price $6.00 printed copy; $1.45 microfiche. Louisiana State University, Baton Rouge, Center for Wetland Resources Report LSU-SG-72-05, 1972. 345 p, 79 fig, 110 tab, 15 ref.

Descriptors: *Harbors, *Oil spills, *Water pollution effects, *Ecosystems, *Louisiana, Gulf of Mexico, Environmental effects, Biology, Aquatic life, Coasts, Estuaries, Ecology, Model studies, Tidal effects, Sediment transport, Engineering structures, Planning, Projections, Forecasting, Path of pollutants, Winds, Ocean currents, Littoral drift, Surveys, Continental shelf.
Identifiers: *Superport construction planning (La).

The objectives were (1) to conduct an overall environmental evaluation of a Superport operation at two hypthetical locations on the continental shelf off the southeast coast of Louisiana, (2) to establish wihin the limits of available data the existing environmental conditions at and around the proposed sites, and (3) to predict and/or document (a) the effects of an oil spill at or near the proposed sites and (b) the effects of operations. Oil-drift projections indicate that the site more distant from shore would have less effect because a potential spill there would probably not reach the estuarine areas. Oil-drift projections of hypothetical oil spills are based on a hydrodynamical numerical model using wind conditions, local tides, and bathymetry. At the closer offshore site oil spills moved either northwest toward Timbalier Bay or northeast toward Barataria Bay. Oil spills at the farther offshore site did not impinge on the shorelines nor into the estuaries. Potential adverse effects resulting from an oil spill would be most severe in the estuaries. Oil could damage or kill extensive areas of marsh grass, thereby reducing or eliminating the most important food source for the major consumers, which are fishery species. Damage to the Gulf shoreline would probably be minimal unless the oil concentrated in the littoral currents, which are also used as a migratory aid. (Woodard-USGS)
W73-14592

STUDENT PROJECTS ON COASTAL ZONE AND OFFSHORE RESOURCES MANAGEMENT,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 02L.
W73-14615

AQUATIC INSECT COMMUNITIES IN THE RIVERS OF THE YORO, OBITSU, AND ISUMI, CHIBA PREFECTURE, JAPAN, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
H. Tanaka
Bull Freshwater Fish Res Lab Tokyo Vol 21 No 1, p 21-35 1971 Illus (English summary)
Identifiers: *Aquatic insects, Baetis Sp, Bamboo, Caddis Fly, Indicators, Industrial wastes, Invertebrates, Isonychia Japonica, *Japan (Chiba prefecture), Pollution, Rivers, Waste water, *Water pollution index.

In Nov. 1968, 23 stations were selected along three rivers that flow through sandstone areas and aquatic insect communities found there were investigated. The geographic and topographical features of the rivers are shown and water quality was observed. Insects were collected on the stony bed riffles and in the partially submerged bamboo bushes on the banks. Species (50) of insects and 9 species of other invertebrate animals were collected at the Yoro River. At the Obitsu River, 40 species of insects and 3 species of other invertebrate animals were collected. Finally, 34 species of insects and 8 species of other invertebrate animals were collected at the Isumi River. As many as 25 species of insects were found in all rivers. In all rivers, free-swimming mayflies showed predominant tendency, while the subsistence density of net-spinning caddis-flies was extremely low. In the majority of insects, practically no habitat preference was evident. Baetis sp. appear to be comparatively resistant against pollution by inorganic suspended matter. The aquatic areas were divided into 4 degrees, A-D, of pollution on the basis of number of species of insect communities at the stony bottom and the partially submerged bamboo. The assessment of water pollution of the sandy bed rivers attempted on the basis of the insect communities found in the partially submerged bamboo bushes is likely to be used in the future as one of the biological assessment methods of water pollution.--Copyright 1973, Biological Abstracts, Inc.
W73-14617

TIME SENSING AND ANALYSIS OF COASTAL WATERS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02L.
W73-14631

TURBIDITY, TRANSPARENCY AND COLOR OF WATER IN THE ESTUARY AREA (MUTNOST', PROZRACHNOST' I TSVET VOD VZMOR'YA),
For primary bibliographic entry see Field 02L.
W73-14637

LATERAL DIFFUSION IN A TIDAL ESTUARY,
Baghdad Univ. (Iraq). Coll. of Engineering.
For primary bibliographic entry see Field 02L.
W73-14647

SOME ASPECTS OF THE OCEANOGRAPHY OF LITTLE PORT WALTER ESTUARY, BARANOF ISLAND, ALASKA,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 02L.
W73-14665

EXPERIMENTAL STUDY OF WATERFLOOD TRACERS,
Jersey Production Research Co., Tulsa, Okla.
For primary bibliographic entry see Field 02E.
W73-14727

5C. Effects of Pollution

THE LIMNOLOGY OF TWO DISSIMILAR SUBARCTIC STREAMS AND IMPLICATIONS OF RESOURCE DEVELOPMENT,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.

/73-14203

ELATIONSHIP BETWEEN EXTRACELLU-AR AND CELLULAR PRODUCTION IN THE ULPHURIC GREEN BACTERIUM HLOROBIUM LIMICOLA NADS. CHLOROBACTERIACEAE) AS COMPARED O PRIMARY PRODUCTION OF HYTOPLANKTON,
ialystok Medical Academy (Poland). Dept. of iology.
. Czeczuga, and F. Gradzki.
ydrobiologia, Vol 42, No 1, p 85-95, July 6, 1973. fig, 1 tab, 28 ref.

escriptors: *Primary productivity, *Organic atter, *Bacteria, *Phytoplankton, Photosynthes-, Bioassay, Carbon, Radioactivity techniques, hotosynthetic bacteria.
lentifiers: *Chlorobium limicola, *Poland, Sam-e preparation, Organic carbon, Wadolek Lake.

ark and double light bottles containing Chlorobi-n limicola and phytoplankton from two stands ere immersed in Wadolek Lake at depths of 0 to m to study the quantities of substances formed uring photosynthesis both inside and outside the ells. Each bottle was spiked with C-14-labelled aCO3. Assimilation of carbon and quantities of ubstances filtering outside the cells were also etermined in the dark bottles. After one day at ny depth, formalin was added to each bottle and ne contents filtered to separate algal cells from hlorobium bacteria. After drying of the filters, ne residue was measured with a Geiger-Mueller ounter. To measure extracellular matter, a por-on of the contents of each bottle was put on an luminum plate, evaporated and the activity mea-ured. Mean values of extracellular production of hytoplankton were 58.4 percent (stand II) and 5.2 percent (stand I) of cellular production, and or extracellular production of Chlorobium micola the values were respectively 44.7 percent tand II) and 70.7 percent (stand I). On the verage 70.8 percent of carbon assimilated in the ark filtered outside the cell in case of phytoplank-on, and 31.0 percent in the case of Chlorobium micola. Extracellular and cellular production in ase of phytoplankton and Chlorobium limicola as calculated for 1 square meter of the water olumn. (Little-Battelle)
V73-14245

PTAKE OF RADIONUCLIDES BY SOME QUATIC MACROPHYTES OF ISMAILIA ANAL, EGYPT,
tomic Energy Establishment, Cairo (Egypt). adiation Protection Dept.
V. E. Y. Abdelmalik, R. M. K. El-Shinawy, M. M. shak, and K. A. Mahmoud.
Hydrobiologia, Vol 42, No 1, p 3-12, July 6, 1973. 5 ab, 10 ref.

Descriptors: *Bioassay, *Radioactive wastes, Bioindicators, Aquatic plants, Absorption, Water ollution effects, Radioisotopes, Algae, Sago ondweed, Mathematical studies, Chara.
dentifiers: *Bioaccumulation, Cs-134, Co-60, Sr-0, P-32, Elodea densa, Ceratophyllum demersum, Potamogeton pectinatus, Ismailia Canal, *Egypt, Waterweeds, Hornworts, Data interpretation.

The uptake and accumulation of Cs-134, Co-60, Sr-90, and P-32 were studied with four aquatic nacrophytes: Elodea densa, Ceratophyllum demersum, Potamogeton pectinatus, and Chara sp. Tests were conducted with plants in large aquaria containing canal water labelled with the radionuclides. Periodically, portions of the plants were removed, dipped in running distilled water, blotted on filter paper, weighed, dried, ashed, and radioassayed. Statistical evaluations of the cor-relation between radionuclide concentration and uptake by the plants led to the following conclu-sions. (1) Uptake of the radionuclides was found to increase at increasing initial concentrations of the radionuclides in the water. (2) Maximum uptake was reached by most of the aquatic plants after different periods of contamination, ranging from 1 to 4 days. (3) Ceratophyllum was the most favora-ble biological indicator for strontium radioisotopes in concentrations ranging from 0.5 to 10 microcu-ries/l and for contamination periods up to 16 days. (4) Elodea was found to serve as a biological in-dicator for either strontium or phosphorus radioisotopes for limited contamination periods of 2 to 16 days for Sr and to 2 days for P isotopes. (5) Potamogeton was also found to serve as a biologi-cal indicator for limited contamination periods for strontium, phosphorus and cesium radioisotopes: 0 to 2 days for Sr, 2 to 16 days for P, and 0 to 2 days for Cs isotopes. (Little-Battelle)
W73-14247

ECOLOGICAL STUDIES IN THE PLANKTON OF CERTAIN FRESHWATER PONDS OF HYDERABAD-INDIA. III. ZOOPLANKTON AND BACTERIA,
Osmania Univ., Hyderabad (India). Hydrobiology Lab.
G. Seenayya.
Hydrobiologia, Vol 41, No 4, p 529-540, May 30, 1973. 8 fig, 2 tab, 27 ref.

Descriptors: *Ecology, *Biological communities, *Zooplankton, *Phytoplankton, *Bacteria, Animal populations, Organic matter, Water quality, Nutrients, Dominant organisms, Phosphates, Dis-solved solids, Crustaceans, Copepods, Water-fleas, Ponds, Rotifers, Rain, Algae, Diatoms, Limiting factors, Chlorella.
Identifiers: Chlorophyll a, Organic nitrogen, *In-dia, Macroinvertebrates, Macrothrix, Chydorus, Ceriodaphnia, Simocephalus, Alona, Pleuroxus, Latonopsis, Camptocercus, Chara, Nitella, Micro-cyclops, Mesocyclops, Ectocyclops, Eucyclops, Diaptomus, Thermocyclops, Periodicity, Euglena haematodes, Nitzschia gracilis, Anabaenopsis raciborakii, Lyngbya mucicola.

The ecological behavior of zooplankton and bac-teria were studied in freshwater ponds in India. Populations of the organisms were determined and related to rainfall and several chemical parameters (oxidizable and nitrogenous organic matter, phosphates, and dissolved solids). Cladocerans were more abundant than copepods, rotifers or os-tracods in all the ponds investigated. The pond harboring Chara and Nitella had a dense popula-tion of Chydorus. Thermocyclops grew abun-dantly in oxygen-rich water. The pulses of zooplankton preceded those of phytoplankton and the grazing effect was very well marked in one of the ponds. Ponds smaller in dimension harbored denser populations of bacteria. Higher concentra-tions of phosphate, dissolved solids, and oxidiza-ble and nitrogenous organic matter favored their multiplication. Bacterial pulses almost coincided with those of phytoplankton - more precisely with chlorophyll-a. Possibly microbes fed on the freshly liberated materials from the phytoplank-ters. (See also W73-06313) (Little-Battelle)
W73-14248

NITROGEN AND PHOSPHORUS IN A STRETCH OF THE GUADALUPE RIVER, TEX-AS, WITH FIVE MAIN-STREAM IMPOUND-MENTS,
Southwest Texas State Univ., San Marcos.
For primary bibliographic entry see Field 05B.
W73-14249

THE LIMNOLOGY OF NITROGEN IN AN OKLAHOMA RESERVOIR: NITROGENASE ACTIVITY AND RELATED LIMNOLOGICAL FACTORS,
Oklahoma State Univ., Stillwater. Dept. of Zoolo-gy.
D. W. Toetz.
The American Midland Naturalist, Vol 89, No 2, p 369-380, April 1973. 7 fig, 3 tab, 20 ref. OWRR-A-012-OKLA (4).

Descriptors: *Nitrogen fixation, *Nitrogen cycle, *Nitrification, Water analysis, Water temperature, Nitrates, Nitrites, Ammonia, Nitrogen, Lakes, Plankton, Cyanophyta, Nutrients, Seasonal, Sedi-ments, Absorption, Enzymes, Secchi disks, *Oklahoma.
Identifiers: *Nitrogenase, Acetylene reduction, Transparency, *Lake Carl Blackwell (Oklahoma), Mineralization.

The surface waters of Lake Carl Blackwell, Oklahoma, were assayed, using acetylene reduc-tion techniques, for their N2 fixing potential at in-tervals of 2 to 3 weeks, between November 1969, and July 1971. Data were obtained on limnological factors which affect the rate of N2 fixation; tem-perature, transparency of the water and concen-tration of nitrate, nitrite and ammonia at meter in-tervals. The ranges of the rates of ethylene production by concentrated and unconcentrated plankton were 0.1 to 225.6 and 50.6 to 185.4 nmoles per mg N hr, respectively. Rates fluctuated widely during the season and were nil in winter. Acetylene reduction at the surface was associated with the expanding phase of blooms of blue-green algae. Acetylene reduction by the sediments was also observed and uptake of Nitrogen-15 by the plankton verified that an N2 fixing potential exists in the lake. Observations on the seasonal cycle of inorganic nitrogen revealed that nitrification predominated in winter and early spring. Decreases in inorganic N in early summer at the surface were attributed to uptake by autotrophs. Mineralization proceeded after the demise of the autotrophs in autumn. During summer stagnation, nitrate, ammonia and nitrite were stratified, but there was no evidence of denitrification. (Little-Battelle)
W73-14253

THE ENVIRONMENTAL TOXICITY OF CRAS-SIN ACETATE USING TETRAHYMENA PYRIFORMIS AS A MODEL,
Oklahoma Univ., Norman. Dept. of Zoology.
D. L. Perkins, and L. S. Ciereszko.
Hydrobiologia, Vol 42, No 1, p 77-84, July 6, 1973. 4 fig, 5 ref.

Descriptors: *Bioassay, *Toxicity, *Protozoa, Reproduction, Growth rates, Ecology, Coral, Animal physiology.
Identifiers: Crassin acetate, Tetrahymena pyrifor-mis, Pseudoplexaura porosa, Mobility.

Crassin acetate, a macrocyclic diterpene lactone, may constitute as much as 1.5 percent of the dry weight of the cortex of the gorgonian Pseudoplex-aura porosa (HOUTTUYN). An amicromucleate strain of Tetrahymena pyriformis was cultured and subjected to various concentrations of the compound to investigate its effect on motility and growth. The effects of the compound were essen-tially concentration dependent and for concentra-tions of 0.027 to 0.133 millimoles, they may be summarized as follows: increased generation time from 0 to 14 hours after subculture; decreased population density; decreased motility; and death. The conclusions of this investigation have been extended to include a possible role of the macro-cyclic diterpenes in their natural environment, i.e., crassin acetate and related compounds function in the marine ecosystem by decreasing the viability of ciliated larvae of organisms which compete with the gorgonians for space. (Little-Battelle)
W73-14255

TOXICITY ASSESSMENT OF TREATED MU-NICIPAL WASTEWATERS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
L. A. Esvelt, W. J. Kaufman, and R. E. Selleck.

Journal Water Pollution Control Federation, Vol 45, No 7, p 1558-1572, July 1973. 4 fig, 6 tab, 12 ref.

Descriptors: *Bioassay, Waste water (Pollution), Waste water treatment, *Toxicity, *Sewage effluents, *Water pollution effects, Laboratory tests, Freshwater fish, Lethal limit, Mortality, Pilot plants, *Shiners, Sticklebacks, Chemical precipitation, Ion exchange, Activated sludge, Sewage treatment, Biological treatment, Nutrient removal, Pollutants, Ammonia, Organic compounds, Heavy metals, Lead nickel, Cadmium, Copper, Zinc, Sulfides, Phenols, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Hydrogen ion concentration, Phosphorus, Sorption.
Identifiers: Golden shiner, *Three-spined stickleback, Median tolerance limit, Continuous flow technique, Notemigonus crysoleucas, Gasterosteus aculeatus, Chemical composition, Lime precipitation, Grease, Dechlorination, Clinoptilolite ion exchange, Atomic absorption spectrophotometry, Cyanides, Methylene blue active substance.

Bioassay studies of the toxicity of municipal wastewaters and its removal by conventional and advanced waste treatment processes were conducted with effluents from full-scale and pilot-plant treatment facilities. Wastewater toxicities were determined before and after each treatment process with continuous-flow, on-line bioassays using golden shiners and three-spined sticklebacks. Primary effluent 96-hr TL50 values from four communities averaged about 45 percent. Good correlations were observed between the toxicity and methylene blue active substance and NH3-H concentrations in primary and treated effluents. Biological treatment with activated sludge at conventional loadings removed most toxicity from primary effluents, and chemical precipitation with lime at pH 11, followed by recarbonation, reduced the toxicity to an average 96-hr TL50 of 75 percent. Further ion exchange and sorption treatments resulted in even less toxic effluents. Chlorination of all effluents resulted in increased toxicity, and dechlorination with sodium bisulfate resulted in the removal of all chlorine-induced toxicity. (Holoman-Battelle)
W73-14258

EFFECTS OF POLLUTION ON FRESHWATER FISH,
National Water Quality Lab., Duluth, Minn.
J. M. McKim, G. M. Cristensen, J. H. Tucker, and M. J. Lewis.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1370-1407, June 1973. 375 ref.

Descriptors: *Water pollution effects, *Freshwater fish, *Reviews, *Analytical techniques, *Bibliographies, Methodology, *Chemical analysis, Heavy metals, Aquatic environment, Ecosystems, Fish physiology, Fish behavior, Stress, Pesticide toxicity, Animal metabolism, Fish reproduction, Water pollution, Fish diseases, Bioassay, Lethal limit, Fish populations, Mortality, Organic wastes, Industrial wastes, Oil spills, Alkaline earth metals.
Identifiers: *Animal tissues, Bioaccumulation, Mobilization, Biological magnification, Biomonitoring, Sample preparation, Fate of pollutants, Biotransformation, Guppy, Poecilia recticulatus, Histopathology, Ictalurus punctatus, Ictalurus furcatus, Blue catfish, American eel, Anguilla rostrata, Stizostedion vitreum, Salmo trutta, Species diversity, White sucker, Catostomus commersoni, Oxygen consumption, Dolly varden trout, Salvelinus malma.

An extensive literature review is presented which is concerned with the effects of pollutants (metals, pesticides, detergents, industrial wastes) on freshwater fish; chemical and biological methods for identifying and determining the effects of such pollutants; and the effects of the water quality parameters salinity, oxygen, and pH on freshwater fish. (Holoman-Battelle)
W73-14259

MICROBIOLOGY - WATERBORNE OUTBREAKS,
National Environmental Research Center, Cincinnati, Ohio.
G. R. Craun.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1265-1277, June 1973. 126 ref.

Descriptors: *Water pollution effects, *Potable water, *Human diseases, *Reviews, *Bibliographies, Epidemiology, Water pollution, Salmonella, Wells, Lakes, Springs, Coliforms, Algae, Pollutant identification, Clams, Septic tanks, Vegetable crops, Path of pollutants, Turtles, Public health, Water supply, Snails, Crustaceans, Shrimp, Lead, Toxicity, Sulfates, Viruses, Rivers, Trematodes, Animal parasites, Protozoa, Dinoflagellates.
Identifiers: Salmonella typhi, Shigella sonnei, Providencia, Phages, Fecal coliforms, Infectious hepatitis, Salmonella paratyphi, Fecal pollution, Salmonella paratyphoid, Vibrio cholerae, Bulinus truncatus, Biomphalaria pfeifferi, Bulinus africanus, Bulinus nasutus, Schistosoma mansoni, Schistosoma haematobium, Schistosoma japonicum, Schistosoma boris, Leptospira pomona, Leptospira canicola, Leptospira autumnalis, Leptospira icterohaemorrhagiae, Balantidium coli, Polioviruses, Cyclops, Naegleria fowleri, Naegleria gruberi, Acanthamoeba castellanii, Acanthamoeba polyphoga, Vibrio parahaemolyticus, Gonyaulax.

Brief accounts are presented of illnesses resulting from waterborne pathogens as described in the 1972 literature. (Little-Battelle)
W73-14262

AQUATIC SEDIMENTS,
Massachusetts Univ., Amherst.
W. C. Ku, and G. W. Foess.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1301-1310, June 1973. 82 ref.

Descriptors: *Reviews, *Aquatic soils, *Bottom sediments, *Analytical techniques, *Cycling nutrients, *Sinks, *Bibliographies, Methodology, Bottom sampling, Water pollution sources, Heavy metals, Chemical analysis, Pesticide kinetics, Degradation (Decomposition), Path of pollutants, Sediment transport, Separation techniques, Alkali metals, Alkaline earth metals, Pollutant identification, Eutrophication, Lake sediments, Phosphates, Sediment-water interfaces, Nitrogen cycle, Adsorption, Manganese, Absorption, Mercury, Sorption, Lead, Nitrilotriacetic acid, Salmonella, Coliforms, Mud-water interfaces, Water quality, Cores, Core drilling, Oxidation-reduction potential, Soil properties, Pesticide residues, DDT, Radioisotopes, Zinc radioisotopes, Protozoa, Benthic fauna, Nitrogen fixation, Oxygen sag, Tracers, Annelids, Water pollution effects, Phosphorus, Dissolved oxygen, Clay minerals, Solvent extractions, Carbon, Calcium, Magnesium, Potassium, Aluminum, Iron, Copper, Nickel, Cobalt, Molybdenum, Tritium, Bacteria, Organic matter, Microorganisms.
Identifiers: *Nutrient interchange, Mobilization, Chemical composition, Fate of pollutants, Phosphorus cycle, Mercury cycle, Pollutant removal, Ekman sampler, Fecal coliforms, Flameless atomic fluorescence, Gel filtration chromatography, Organic carbon, Organic nitrogen, Cr-51, Zn-65, Chromium radioisotopes, Nereis diversicolor, Polychaetes, Adsorbents, Mercuric chloride, Methylmercuric chloride, Ammonium, Vanadium, Solubilization, Heterotrophic bacteria, Marine sediments, Phosphatase, Enzyme activity, Mineralization.

A literature review covers the role of aquatic sediments in relation to water quality, nutrient cycling and interchange, and pollutant kinetics. Included also are (1) methods for sampling and analyzing such sediments, and (2) chemical characteristics and biological aspects of aquatic sediments. (Holoman-Battelle)
W73-14265

MARINE AND ESTUARINE POLLUTION,
California State Univ., Long Beach Dept of Biology.
For primary bibliographic entry see Field 05B
W73-14266

HEAVY METALS: A REVIEW OF LEAD,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 05B
W73-14267

THERMAL EFFECTS,
Oak Ridge National Lab., Tenn
C. C. Coutant, and H. A. Pfuderer.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1331-1369, June 1973. 428 ref.

Descriptors: *Water pollution effects, *Water temperature, *Thermal pollution, *Aquatic life, *Reviews, *Bibliographies, Heat resistance, Heated water, Thermal stress, Laboratory tests, Bioassay, Powerplants, Effluents, Animal physiology, Aquatic populations, Aquatic productivity, Plant physiology, Animal morphology, Plant morphology, Ecological distribution, Thermal powerplants, Cooling towers.
Identifiers: Species diversity, Cleidodiscus nematocirrus, Ichthyophthirius multifiliis, Diclidophora merlangi, Chondrococcus columnaris, Cod (Fish), Gadus morhua, Vibrio anguillarum, Common sucker, Catostomus commersonii, Bleak, Alburnus alborella, Branchiomyces, Squid, Todarodes pacificus, Food conversion, Mackerels, Oncorhynchus kisutch, Enzyme activity, Salmo trutta, Animal tissues, Brown bullhead, Ictalurus nebulosus.

A thorough literature review is given of the effects of water temperature and/or thermal pollution on aquatic life. (Holoman-Battelle)
W73-14268

EUTROPHICATION,
New York State Dept. of Environmental Conservation, Stony Brook.
J. Foehrenbach.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1237-1244, June 1973. 60 ref.

Descriptors: *Eutrophication, *Nutrient removal, Water pollution sources, *Nutrients, *Nitrogen compounds, *Reviews, *Bibliographies, Water pollution control, *Phosphorus compounds, Trophic level, Algae, Path of pollutants, Sinks, Methodology, Waste water (Pollution), Ion exchange, Volatility, Nitrification, Nitrogen, Denitrification, Nitrogen fixation, Ammonia, Waste disposal, Soil disposal fields, Phosphorus compounds, Nostoc, Nitrogen fixing bacteria, Bottom sediments, Phytoplankton, Anabaena, Absorption, Phosphates, Agricultural runoff, Chelation, Groundwater, Aquatic algae, Cyanophyta, Organic acids, Growth rates, Cycling nutrients, Euphotic zone, Odor-producing algae, Nuisance algae, Mass spectrometry, Chlorophyll, Aquatic productivity, Microbial degradation, Diatoms, Chrysophyta, Plant viruses, Decomposing organic matter, Vitamins, Waste storage, Biochemical oxygen demand, Degradation (Decomposition), Soil drainage, Surface runoff, Temperature.
Identifiers: Nutrient sources, Mobilization, Fate of pollutants, Algal growth potential, Thalassia testudinum, Marine environment, Acetylene reduction, Rivularia, Trichodesmium, N-15,

Nodularia, Eel grass, Zostera marina, Spartina, Bioaccumulation, Species diversity, Recovery, Bacillus cereus, Dissolved organic phosphorus, Biddulphia aurita, Organic phosphorus, Phycoviruses, Organic nitrogen, Biotin, Thiamine, Vitamin B12, Air stripping, Myriophyllum exalbescens, Surface loading, Corbicula fluminia.

The eutrophication process is reviewed from the literature in terms of sources, control, ecological factors, and nutrient removal. (Holoman-Battelle)
W73-14269

FRESHWATER MACROINVERTEBRATES,
National Field Investigations Center, Denver, Colo.
R. W. Warner.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1231-1237, June 1973. 69 ref.

Descriptors: Aquatic animals, *Secondary productivity, Biological communities, Water pollution effects, *Reviews, *Bibliographies, Ecological distribution, *Biorhythms, Environmental effects, Aquatic drift, Aquatic habitats, Growth stages, Niche, Waste water (Pollution), Biomass, Animal metabolism, Animal growth, Animal physiology, Predation, Spatial distribution, Temporal distribution, Sampling, Methodology, Equipment, *Invertebrates, Inorganic compounds, Organic compounds, *Organic wastes, Chemical wastes, Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Radiation, DDT, DDD.
Identifiers: Macroinvertebrates, Data interpretation, Bioaccumulation, Species diversity, Survival, Substrate utilization, Ostracods, Chlamydotheca arcuata, Median tolerance limit, Chironomus tetans, Daphnia magna, Cs-137, Sr-85, Zn-65, Fe-59, Co-57, Mn-54, Aedes aegypti, Cesium radioisotopes, Iron radioisotopes, Manganese radioisotopes, Dursban, Zectran, Hydrocarbons, Immobilization, Gammarus pseudolimnaeus, Chloramines.

This literature review stresses the effects on freshwater macroinvertebrates of various kinds of pollutants: inorganic wastes, organic wastes, pesticides, and radiation. Analyses of biotic communities, secondary productivity, periodicity and drift, distribution and habitat requirements, sampling techniques, and the effects of altering the physical environment are also reviewed. (Holoman-Battelle)
W73-14270

RETENTION OF MERCURY WHEN FREEZE-DRYING BIOLOGICAL MATERIALS,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 05A.
W73-14272

BIOLOGICAL EFFECTS OF COOLING TOWER BLOWDOWN,
National Environmental Research Center, Corvallis, Oreg.
R. B. Garton.
In: Water-1972, AIChE Symposium Series No 129, Vol 69, p 284-292, 1973. 5 fig, 9 tab, 6 ref.

Descriptors: Toxicity, *Rainbow trout, *Bioassay, *Cooling towers, Chromates, Zinc, Phosphates, Sulfates, Sodium, Ammonia, Boron, Water pollution effects, Chlorophyta, Heavy metals.
Identifiers: *Blowdown, Selenastrum capricornutum, Morpholine, Cyclohexylamine, Hydrazine, Salmo gairdneri, Standard methods, Sodium chromate, Zinc phosphate.

Toxicity was determined of a 'typical' cooling tower blowdown and of its individual components. Since blowdown composition is variable, a simulated blowdown was made using chemicals and concentrations listed in waste discharge permit applications. The mixture contained varying amounts of chromate, zinc, phosphate, sulfate, boron, sodium, ammonia, morpholine, cyclohexylamine, and hydrazine and simulated blowdown from the Trojan Nuclear Plant. Separate tests were also conducted with sodium chromate, zinc phosphate, and with blowdown without chromate. Fish (Salmo gairdneri) and an alga (Selenastrum capricornutum) were used in bioassays of the mixtures. Algal assays were conducted according to the 'Algal Assay Procedure, Bottle Test'. Fish bioassays were conducted in accordance with procedures given in 'Standard Methods'. Algal growth was reduced by blowdown at full strenth and at dilutions of 0.1. Fish were killed at dilutions of 0.1; no effect was observed at 0.032 dilution. The LC50 value was 0.068 dilution. With sodium chromate, algal growth was reduced at 0.139 ppm, and fish survived 96 hours at 31 ppm. Zinc phosphate had no significant effect on algal growth at 0.016ppm. The LC50 for fish was 0.09 ppm zinc phosphate. Based on all the tests, zinc and chromium were identified as the toxic components in the blowdown. It is noted that synergistic effects may occur in other mixtures containing different compounds. Furthermore, the organisms used in the bioassays must be specified since toxicities may differ for different ones. (Little-Battelle)
W73-14285

PHYSICO-CHEMICAL ASPECTS OF LAKE MCILWAINE (RHODESIA), A EUTROPHIC TROPICAL IMPOUNDMENT,
Rhodesia Univ., Salisbury. Div. of Biological Sciences.
B. E. Marshall, and A. C. Falconer.
Hydrobiologia, Vol 42, No 1, p 45-62, July 6, 1973. 9 fig, 1 tab, 35 ref.

Descriptors: *Physiochemical properties, *Impoundments, *Eutrophication, Hydrology, *Water quality, Water level fluctuations, Thermal stratification, Water chemistry, Tropical regions, Hydrologic budget, Water temperature, Dissolved oxygen, Nitrates, Ammonia, Hydrogen ion concentration, Conductivity, Nitrites, Chemical analysis, Water analysis, Phosphates, Alkalinity, Hardness (Water), Iron, Manganese, Heavy metals, Hypolimnion, Trophic level, Epilimnion, Water pollution, Pollutant identification.
Identifiers: Seasonal variation, Orthophosphates, *Rhodesia (Lake McIlwaine).

Lake McIlwaine is a tropical eutrophic impoundment in Rhodesia. The normal oxygen and temperature patterns are described, and the effect of flood water on these patterns is discussed. Several important chemical parameters are described, and the effects of lake-level fluctuations and stratification are outlined. There is a brief discussion on the effects of eutrophication in tropical lakes, and some indication is given of measures being taken to reduce nutrient input to Lake McIlwaine. (Holoman-Battelle)
W73-14291

EFFECTS OF REDUCED OXYGEN CONCENTRATIONS ON NORTHERN PIKE (ESOX LUCIUS) EMBRYOS AND LARVAE,
National Water Quality Lab., Duluth, Minn.
R. E. Siefert, W. A. Spoor, and R. F. Syrett.
Journal of the Fisheries Research Board of Canada, Vol 30, No 6, p 849-852, June 1973. 2 fig, 1 tab, 16 ref.

Descriptors: *Bioassay, *Reproduction, *Dissolved oxygen, Water temperature, Flow rates, *Pikes, Larvae, *Embryonic growth stage, Water pollution effects, Limiting factors, Mortality, Hatching.
Identifiers: Survival, Esox lucius.

The objective was to determine the effects of continuous dissolved oxygen concentrations in the range 50-12.5 percent saturation on the survival and development of northern pike (Esox lucius) embryos and larvae from egg fertilization until all surviving larvae fed. Eggs were mixed with milt for fertilization and placed in acrylic plastic experimental chambers containing three compartments, one compartment where the water and gas mixture entered, one containing the embryos, and one containing larvae. Tests were conducted at combinations of temperatures, flow rate, and oxygen concentration. At 15 and 19C, and at flows of 60 and 30 ml/min (velocities about 3.3 and 1.6 cm/min), 50 percent oxygen saturation was sufficient for survival and development of northern pike from fertilization until all surviving larvae fed. Oxygen tensions of about 33 percent saturation appeared inadequate for proper survival. (Little-Battelle)
W73-14306

CADMIUM UPTAKE BY FIDDLER CRABS EXPOSED TO TEMPERATURE AND SALINITY STRESS,
South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
J. O'Hara.
Journal of the Fisheries Research Board of Canada, Vol 30, No 6, p 846-848, June 1973. 1 tab, 11 ref.

Descriptors: *Bioassay, *Cadmium, *Salinity, *Water temperature, Heavy metals, Radioactivity techniques, *Crabs, Absorption, *Thermal stress, Salt tolerance.
Identifiers: Fiddler crabs, *Bioaccumulation, Biological samples, Macroinvertebrates, Uca pugilator, Sample preparation, Scintillation counting, Gills, Hepatopancreas.

Fiddler crabs (Uca pugilator) were collected from an unpolluted estuary near Georgetown, South Carolina and, after acclimation, subjected to 1 microcurie of Cd-109 and 10 ppm Cd (2 plus) as cadmium chloride in filtered seawater at temperature and salinity combinations of 33, 25, and 10C and 3.0 and 1.0 percent salinity. After 24, 48, and 72 hr, samples were sacrificed and the gill and hepatopancreas weighed and digested for 24 hr. Scintillation fluid was added to the digested sample and Cd determined by scintillation counting. At each temperature crabs accumulated more Cd in low salinity water than in high salinity water. This effect is probably due to osmotic stress caused by the different salt concentrations. Maximum accumulations occurred at high temperature and low salinity with totals for gill and hepatopancreas of 4.98 micrograms at 24 hr, 10.10 micrograms at 48 hr, and 17.44 micrograms at 72 hr. (Little-Battelle)
W73-14307

MOLYBDENUM CONCENTRATIONS IN TISSUES OF RAINBOW TROUT (SALMO GAIRDNERI) AND KOKANEE SALMON (ONCORHYNCHUS NERKA) FROM WATERS DIFFERING WIDELY IN MOLYBDENUM CONTENT,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
For primary bibliographic entry see Field 05B.
W73-14309

SUMMER ALGAL COMMUNITIES AND PRIMARY PRODUCTIVITY IN FISH PONDS,
Alabama Agricultural Experiment Station, Auburn.
C. E. Boyd.
Hydrobiologia, Vol 41, No 3, p 357-390, May 15, 1973. 10 fig, 6 tab, 61 ref.

Descriptors: *Primary productivity, Biological communities, *Aquatic algae, *Phosphorus, *Nitrogen, Water pollution effects, Ecology, Phytoplankton, Eutrophication, *Cyanophyta, Fertilization, Nutrients, Standing crops, Chrysophyta, Chlorophyta, Euglenophyta, Pyr-

rophyta, Systematics, Dominant organisms, Protozoa, Ecological distribution, Photosynthesis, Turbidity, Water chemistry, Ammonia, Hardness (Water), Nitrates, Alkalinity, Phosphates, Respiration, Chlorella, Chlamydomonas, Euglena, Diatoms, Cladophora, Competition, Laboratory tests, Dissolved oxygen, Water sampling.
Identifiers: *Fish ponds, Oscillatoria, Raphidiopsis curvata, Anacystis spp, Microcystis aeruginosa, Coelosphaerium, Anabaena circinalis, Ictalurus punctatus, Chlorophyll a, Coelastrum microporum, Desmids, Dictyosphaerium, Scenedesmus spp, Flagellates, Gloeocystis, Closterium, Crucigenia, Kirchneriella, Chlorococcum, Chlorogonium, Bumilleria, Tetraedron, Roya, Gomphosphaeria, Species diversity index, Spirogyra spp, Chara spp, Nitella, Rhizoclonium hieroglyphicum, Pithophora kewensis, Hydrodictyon reticulatum, Lyngbya, Oedogonium, Cosmarium tumidum, Ankistrodesmus falcatus, Sphaerocystis schroeteri, Quadrigula chodatii, Oocystis borgei, Planktosphaeria gelatinosa, Coelastrum proboscideum, Merismopedia tranquilla, Anacystis cyanea, Spirulina princeps, Nannochloris bacillaris, Schroederia ancora, Nephrocytium agardhianum, Staurastrum natator, Sphaerocystis schroeteri.

Data are presented on primary productivity and phytoplankton communities in new experimental ponds which received the following treatments; ammonium nitrate and triplesuperphosphate, triplesuperphosphate, cracked corn (10 percent crude protein) and Auburn No. 3 fish feed (36 percent crude protein). Comparative data on algal communities were also obtained from production ponds which received feeds or fertilizers. Basic ecological data on macro-algae are also presented. All nutrient additions to experimental ponds resulted in higher levels of gross photosynthesis and greater concentrations of chlorophyll a than were found in the control treatments. Fertilization with both nitrogen and phosphorus gave the highest values. Chlorophyll a and gross photosynthesis were higher in ponds receiving high protein content feed (Auburn No. 3) than in ponds to which low protein content feed (corn) was applied. Persistent blooms of blue-green algae occurred in ponds receiving nitrogen and phosphorus fertilization. Phosphorus only fertilization produced blooms of blue-greens, but these blooms did not persist as in the ponds to which nitrogen was also added. Control ponds were dominated by green algae. Blue-green algae were seldom abundant in feed treatments. Production ponds had high level of gross photosynthesis and large concentrations of chlorophyll a. Many of the production ponds which received feed applications developed heavy blooms of blue-green algae. The major species of blue-green algae observed were Oscillatoria sp., Raphidiopsis curvata, Anacystis nidulans, A. aeruginosa, Spirulina sp., and Anabaena circinalis. Heterocyst bearing forms, which can presumably fix nitrogen, were seldom noted in ponds that received continuous additions of nitrogen from fish feeds. Macro-algae are abundant in many fish ponds. Data illustrating the competition of macro-algae with phytoplankton are presented. (Holoman-Battelle)
W73-14315

ORGANICS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05A.
W73-14317

THE METABOLISM OF LONG-CHAIN FATTY ACIDS AND ALCOHOLS BY CANDIDA TROPICALIS AND SACCHAROMYCES CEREVISIAE,
G. H. Bell.
Antonie van Leeuwenhoek, Vol 39, No 1, p 137-149, 1973. 6 fig, 5 tab, 10 ref.

Descriptors: *Metabolism, *Yeasts, *Alcohols, Growth rates, Organic acids, Marine fungi, Organic compounds, Plant growth, Hydrogen ion concentration
Identifiers: *Fatty acids, Substrate utilization, Batch cultures, Heterotrophic nutrition, Candida tropicalis, Saccharomyces cerevisiae, Aliphatic hydrocarbons, Tetradecanoic acid, Fate of pollutants, n-Paraffins, Octadecanoic acid, Dodecanoic acid, Gas oil, Continuous cultures, Pristane, Undecanoic acid, Tridecanoic acid, 1-Dodecanol, 1-Tetradecanol, 1-Hexadecanol, 1-Octadecanol, Hexadecanoic acid, Nonadecanoic acid, Eicosanoic acid, 1-Eicosanol.

The factors affecting the growth of Candida tropicalis and Saccharomyces cerevisiae on medium- and long-chain fatty acids and alcohols in batch culture were investigated. Growth on solid acids and alcohols dispersed in the medium is a maximum for tetradecanoic acid and tetradecanol. The poorer growth observed on shorter chain lengths can be ascribed to their toxicity to the yeasts, while the fall off in growth on the higher members is explained by their increasing insolubility in the medium. When the longer-chain-length acids are dissolved in a non-metabolizable hydrocarbon, the growth of C. tropicalis is improved, but that of S. cerevisiae is unaffected. This suggests that acids can enter the cells of the former organisms by direct contant with the hydrocarbon droplets. The surface of S. cerevisiae is too hydrophilic for this transfer mechanism to be possible. Fatty acids dissolved in gas oil are utilized as substrates for the growth of Candida tropicalis in competition with the n-paraffins contained in the gas oil. Each fatty acid contributes to a constant proportion of yeast produced, but this proportion decreases as the chain is lengthened. Thus, in mixtures of gas oil with dodecanoic acid, 65 percent of the yeast is produced from metabolism of the acid, while with octadecanoic acid only 15 percent is produced. The log specific rates of utilization of the fatty acids within this range diminish linearly with increasing chain length. (Holoman-Battelle)
W73-14325

ECOLOGICAL EVALUATION OF MULTIUSE WATERS RECEIVING PRIMARY TREATMENT EFFLUENT PRIOR TO A MAJOR FLOW INCREASE,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. D. Buck.
Available from the National Technical Information Service as PB-223 502, $2.75 in paper copy, $1.45 in microfiche. Completion Report, 1973. 6 p, 1 fig, 1 tab, 5 ref. OWRR A-037-CONN (2). 14-31-0001-3207.

Descriptors: *Estuaries, *Sewage effluents, Pollutants, *Phytoplankton, Nitrates, Phosphates, Biochemical oxygen demand, Coliforms, *Connecticut, Invertebrates, Streptococcus, Monitoring, Sampling, Dissolved oxygen.
Identifiers: Fecal streptococci, Benthic invertebrates, *Mumford Cove (Conn).

A chemical and biological study is described for a Connecticut estuary receiving 0.25-0.50 MGD of treated sewage effluent prior to construction of a secondary treatment plant with a projected flow of 5-6 MGD. An adjacent, unpolluted cove was used as a control. Three stations in each estuary were sampled bi-weekly from September 1970 to June 1972. Analyses included temperature, salinity, dissolved oxygen, B.O.D., Nitrate, and phosphate. Counts were made of total bacteria, total and fecal coliforms, fecal streptococci, phytoplankton, and benthic invertebrates. Results indicated that nitrate, phosphate, and D.O. levels at the current outfall area at the head of the receiving cove are high enough to suggest that the increased flow of fresh water and nutrients into the saline cove may produce adverse effects in terms of stimulating the growth of existing populations of flagellated phytoplankters. While only the effluent mixing area is affected at present, the greatly increased effluent volume projected for the cove will influence a larger area as a function of wind, tides, and other factors. The directive by the State of Connecticut Department of Environmental Protection to extend the new outfall area approximately one mile seaward into Fishers Island Sound is considered prudent.
W73-14361

ALGAL PHOTOSYNTHESIS, ALGAL ABUNDANCE, AND CHEMISTRY OF LAKE WATER AT FAIRMONT, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
A. S. Knoll, and R. O. Megard
Available from the National Technical Information Service as PB-223 428, $4.50 in paper copy, $1.45 in microfiche. University of Minnesota Limnological Research Center, Minneapolis, July 1973. 46 p, 17 fig, 7 tab, 8 ref. OWRR A-026-MINN (1).

Descriptors: *Eutrophication, *Algae, *Nutrients, Lakes, *Minnesota, Plankton, Phosphorus, Nitrogen, *Chlorophyll, *Photosynthesis, Nitrates, Water pollution effects.
Identifiers: Fairmont (Minn), Ammonia-nitrogen, Nitrate-nitrogen.

Concentrations of phosphorus, nitrate, ammonia, oxygen, chlorophyll a, and rates of algal photosynthesis in 5 lakes in Fairmont, Minnesota, were measured during spring, summer, and autumn, 1972. The relative abundance of the planktonic algae in the lakes was assessed by measuring the concentrations of chlorophyll a, one of the green pigments in algae and other plants. Average concentrations of chlorophyll a ranged from 43 mg/m3 in Budd Lake to 74 mg/m3 in Amber Lake. The average concentration for all five lakes, 57 mg/m3, is about twice the average concentration in Lake Minnetonka, near Minneapolis, and also about twice the highest concentrations in Lake Erie, the most polluted of the Great Lakes. Concentrations of dissolved phosphorus, nitrate-nitrogen, and ammonia-nitrogen were also very high. Substantial reductions of nutrient concentrations will be required to achieve significant reductions of algae in the Fairmont Lakes. It would be desirable to reduce the influx of both nitrogen and phosphorus, but phosphorus is easier to control, because many of the nuisance algal are able to fix nitrogen if there is sufficient phosphorus in the water.
W73-14364

EFFECT OF SILT AND SILT REMOVAL IN A PRAIRIE LAKE,
Dakota State Coll., Madison, S. Dak. Dept. Biology; and Dakota State Coll., Madison, S. Dak. Dept. of Chemistry.
C. L. Churchill, C. K. Brashier, and G. Leidahl.
Copy available from GPO Sup Doc as EP1.23, 73-037, $2.60; microfiche from NTIS as PB-223 565, $1.45. Environmental Protection Agency, Ecological Research Report EPA-R3-73-037, July 1973. 200 p, 94 fig, 6 tab, 15 ref. EPA Project 16010 DZK.

Descriptors: Water pollution sources, *Sediments, *Nutrients, *Eutrophication, Lakes, Aquatic soils, Minerals, Water properties, *South Dakota, *Silts, Silting, Lake sediments, Water pollution effects, Monitoring.
Identifiers: *Gabion silt traps, Lake Herman (S. Dak), Prairie lakes, Lake Madison (S. Dak).

A surveillance program has been maintained on two shallow, warm water prairie lakes and their tributaries. One of these lakes, Lake Madison, is domestically polluted with the effluent from the sewage treatment plant of Madison, South Dakota. The other, Lake Herman, is polluted due to silta-

tion caused by run-off from a large, intensively farmed watershed. This surveillance program has resulted in comparisons of chemical nutrients and biota of a heavily silted lake with those of a relatively unsilted, but domestically polluted lake. The surveillance program on the Lake Herman tributaries has also led to conclusions regarding nutrient levels in successive spring run-offs. During the summers of 1969 and 1970 a total of seventeen gabion-type silt traps were constructed across the major feeder streams on the Lake Herman watershed in order to retard lake siltation. The traps were of several structural types and were constructed in locations with different types of creekbeds and different water-flow rates in order to evaluate which combinations of design and location were most effective. The traps were successful as filters for large debris but had limited success as silt-retaining devices. However, erosion occurred around or under many of the traps thus diminishing their effectiveness. (EPA)
W73-14373

THE DISINFECTION OF SEWAGE BY CHLOROBROMINATION,
Dow Chemical Co., Midland, Mich. Hologens Research Lab.
For primary bibliographic entry see Field 05D.
W73-14396

BIOLOGICAL EFFECTS OF FENITROTHION IN THE DIET OF BROOK TROUT,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. J. Wildish, and N. A. Lister.
Available from ACS-Div. of Water, Air and Waste Chem., Publications Manager, Mellon Inst., 4400 Fifth Ave., Pittsburgh, Pa. 15213, Price $4.00. In: Preprints of Papers Presented at 165th National Meeting of American Chemical Society, April 8-13, 1973, Dallas, Tex: American Chemical Society, Division of Water, Air and Waste Chemistry, Vol 13, No 1, Paper 76, p 79-84, 1973.

Descriptors: *Pesticide residues, *Fishkill, *Toxicity, Pesticide toxicity, Canada, Forestry, Pest control, Insecticides, *Brook trout.
Identifiers: Spruce budworm, *Fenitrothion.

Aerial insecticide spraying to control the spruce budworm, a defoliating insect pest which seriously reduces tree growth, was begun in 1952 with DDT, but fenitrothion, 0,0-dimethyl-0 (3-methyl-4-nitrophenyl) phosphorothionate, has been used since 1968. The possibility that aquatic and terrestrial insects killed by operational spray doses of fenitrothion may cause lethal or sublethal effects directly in salmonids was shown by experiments to be unlikely. The highest level found in poisoned insects is 3,000 times less than the level at which behavioral effects were noted. Reductions in insects following spraying may be of sufficient magnitude and persistence to significantly reduce ration and hence reduce salmonid production. (Knapp-USGS)
W73-14398

CONCERNING THE INFLUENCE OF HERBICIDES ON SEVERAL FRESHWATER ANIMALS, UBER DEN EINFLUSS DER HERBIZIDE AUF EINIGE SUSSWASSERTIERE,
O. Pravda.
Hydrobiologia, Vol 42, No 1, p 97-142, July 1973. 17 fig, 20 tab, 80 ref.

Descriptors: *Herbicides, *Aquatic animals, *Bioassay, *Pesticide toxicity, *Water pollution effects, Invertebrates, Freshwater fish, Carbamate pesticides, Phenolic pesticides, Lethal limit, Laboratory tests, Chlorinated hydrocarbon pesticides, Frogs, Isopods, Crustaceans, Amphipoda, Waterfleas, Amphibians, Annelids, Tubificids, Gastropods, Mollusks, Carp, Phenols, Inorganic pesticides, Aquatic insects, Perches, Water temperature.
Identifiers: *Median tolerance limit, Sensitivity, Macroinvertebrates, Red-sided shiner, Phoxinus phoxinus, Planaria gonocephala, Turbellaria, Platyhelminthes, Tubifex, Lymnaea stagnalis, Pond snails, Scuds, Gammarus pulex, Daphnia pulex, Asellus aquaticus, Micronecta minutissima, Esox lucius, Northern pike, Cyprinus carpio, Leucaspius delineatus, Perca fluvatilis, Rana temporaria, Bugs, Tadpoles, Travex, Kampinex L, Rafex, Dinoseb, Agrion, Dikotex 30, MCPA, DP-Fest, Spritz-Hormit, TCP, NaTA, Ugex. Alipur, Liro CIPC, Phenoxyacetic acid.

Toxicity of fourteen herbicides has been determined for thirteen animal species: Planaria gonocephala, Tubifex sp, Lymnaea stagnalis, Daphnia pulex, Gammarus pulex, Asellus aquaticus, Micronecta minutissima, Esox lucius, Cyprinus carpio, Phoxinus phoxinus, Leucapius delineatus, Perca fluviatilis, Rana temporaria, in 510 laboratory experiments. It was followed in three concentrations and expressed both in tables, by the value LT50 or by the various degree of damage of the organisms, and in graphs. The organisms were divided into four groups according to their sensitivity to herbicides: (1) organisms with high sensitivity; (2) sensitive; (3) medium sensitive; (4) little sensitive. From the point of view of the toxicity the herbicides were divided into three groups: (1) powerfully toxic, (2) medium toxic; (3) little toxic. A relationship between the intensity of toxicity and the chemical structure of herbicides was found. The first group includes herbicides on the basis of carbamates and phenols, the second group includes the derivatives of phenoxyacetic acid, and the third group includes inorganic herbicides and those pertaining to the group of the chlorated organic substances. The menchanism of the toxic action was followed from the point of view of the mutual relationship of herbicide toxicity and the sensitivity of organisms. Eight basic types of this action were found. Special attention was paid to those types where significant reparation phases appeared during the experiments. Only inorganic herbicides and those from the group of the chlorated organic substances or eventually those on the basis of phenoxyacetic acid may be used for mass application in water economy. The use of herbicides from the group of phenols and carbamates should be prohibited near water bodies. (Holoman-Battelle)
W73-14437

EXAMINATION OF ULTRASTRUCTURE AND GROWTH OF THE CELL WALL OF SPYRIDIA FILAMENTOSA (WULF.) HARV., UNTERSUCHUNGEN UBER BAU UND WACHSTUM DER ZELLWANDE VON SPYRIDIA FILAMENTOSA (WULF.) HARV.),
Thessaloniki Univ., Salonika (Greece). Botanical Inst.
V. I. Tsekos, and S. Haritonidis.
Nova Hedwigia, Vol 23, No 4, p 785-793, 1972. 1 fig, 21 ref.

Descriptors: *Rhodophyta, *Marine algae, *Cytological studies, Plant growth, Marine plants, Electron microscopy, Plant tissues, Cellulose.
Identifiers: *Ultrastructure, *Cell wall, *Spyridia filamentosa, Polarization microscopy.

The structure and the course of development in cell walls of the red alga Spyridia filamentosa (Wulf.) Harv. were analyzed by cytochemistry and polarization microscopy. (1) The cell wall is composed of two layers; the inner one consisting of cellulose, the outer of acid carbohydrates. Contrary to other Rhodophyceae analyzed hetherto, the outer layer of Spyridia filamentosa exhibits birefringence; under the polarization microscope and after staining with methylene blue it appears distinctly stratified. (2) The cell wall proper of the youngest central cells in the thallus tip is uniform, and it encloses the whole protoplast without any gap. As it is the case with Ceramium species, adult central cells show three distinct regions: two cap-like parts (each of which at the basal and spical pole of the cell) and a conic part encircling the remainder of the cell. The origin of the wall structure of adult central cells is discussed. (3) The inner layer of the cell wall is composed of lamellae. (4) The intensity of the cellulose reaction and of birefringence increases with the ace of the cells. In young cells it is rather poor. (5) Nearly all parts of the thallus that border directly to the surrounding water have more or less thickened external walls. (6) Beside the axial pit connections of the central cells, which show an intense light refraction, there are another eighteen pits arranged in a ring at the apical pole. (Holoman-Battelle)
W73-14439

ISOLATION AND PROPERTIES OF RIBONUCLEASE-DEFICIENT MUTANT OF SALMONELLA TYPHIMURIUM,
California Univ., Davis. Dept. of Bacteriology.
For primary bibliographic entry see Field 05A.
W73-14443

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON PRIMARY PRODUCTION AND ZOOBENTHOS OF EL CAPITAN RESERVOIR, CALIFORNIA,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Fast.
Water Resources Research, Vol 9, No 3, p 607-623, June 1973. 10 fig, 2 tab, 37 ref.

Descriptors: *Benthic fauna, *Primary productivity, *Destratification, *Mixing, Sampling, Oligochaetes, Midges, Clams, Phytoplankton, Radioactivity techniques, Animal populations, Tubificids, Mollusks, *California.
Identifiers: Sorting, Sugar flotation, Macroinvertebrates, Limnodrilus hoffmeisteri, Bathrioneurum vejdovskyanum, Evilyodrilus bavaricus, Evilyodrilus hammoniensis, Tubifex tubifex, Chironomus attenuatus, Procladius bellus, Procladius denticulatus, Tanytarsus spp, Corbicula manilensis, Asiatic clam, *El Capitan Reservoir (Calif).

El Capitan reservoir was artificially mixed using compressed air during the summers of 1965 and 1966 to investigate the effects of destratification on primary production and zoobenthos. Phytoplankton production was measured by the C-14 technique. Zoobenthos was sampled with an unscreened Ekman dredge, screened with a no. 30 sieve, and sorted by sugar flotation. Estimates of organisms not sorted by sugar flotation were made by subsampling sediments. Physical and chemical characteristics of the water were also determined. The zoobenthos was numerically dominated by oligochaete worms (Limnodrilus hoffmeisteri, Bathrioneurum vejdovskyanum, Evilyodrilus bavaricus, E. hammoniensis, and Tubifex tubifex) and chironomid larvae (Chironomus attenuatus, Procladius bellus, P. denticulataus, and Tanytarsus spp.). The Asiatic clam (Corbicula manilensis) became well established during the study period. The results show that mixing and reservoir volume increases resulted in more uniform physical and chemical conditions, aerobic conditions throughout the lake, increased primary production, increased depth distributions of zoobenthos, and zoobenthos population increases. Increased primary production was related to a decrease in algal depth distribution. This decrease was caused by incomplete destratification, since thermal microstratification persisted near the lake surface. Zoobenthos were distributed throughout the lake during mixing, whereas they were confined to shallow depths during well-stratified times. Water volumes increased three-fold during the study and greatly confounded interpretation of the mixing effects. (Little-Battelle)
W73-14444

DETRITUS IN LAKE TAHOE: STRUCTURAL MODIFICATION BY ATTACHED MICROFLORA,
California Univ., Davis. Inst. of Ecology.
H. W. Paerl.
Science, Vol 180, No 4085, p 496-498, May 4, 1973. 3 fig, 16 ref.

Descriptors: *Detritus, *Microorganisms, *Biodegradation, *Organic matter, Nutrients, Electron microscopy, Bioassay, Periphyton, Metabolism, *California.
Identifiers: *Lake Tahoe, Ward Creek, Sample preparation, Aggregation.

Water samples were collected from Lake Tahoe over a vertical profile of 0 to 440 m to investigate microbiological utilization of detritus. Subsamples were filtered through Metricel filters, fixed with glutaraldehye, dehydrated by stepwise immersion in increasing concentrations of ethyl alcohol, portions mounted and gold plated, and viewed by scanning electron microscopy (SEM). Subsamples were also monitored for microbial heterotrophic activity as a measure of mineralization rates by determining acetate uptake. Total particulate carbon, and acetate concentrations were determined in samples taken from all depths. In a separate study, detritus was collected from Ward Creek, a tributary of Lake Tahoe, homogenized, sterilized, and divided into dialysis bags which were impervious to detritus and microorganisms, but allowed passage of nutrients and metabolic waste products. Two sets of dialysis bags were used: one containing sterile detritus and one containing lake water and live microorganisms. Both sets were incubated in Lake Tahoe and periodically examined by light microscopy and SEM. The results show that readily identifiable groups of microorganisms present on nonliving particulate organic matter (detritus) in the upper waters of Lake Tahoe are attached in specific ways and appear responsible for detrital aggregation. This microflora is associated with active heterotrophic metabolism, but deeper waters possess little detrital microflora and little heterotrophic activity. (Little-Battelle)
W73-14445

DEEP-SEA MICROORGANISMS: IN SITU RESPONSE TO NUTRIENT ENRICHMENT,
Woods Hole Oceanographic Institution, Mass.
H. W. Jannasch, and C. O. Wirsen.
Science, Vol 180, No 4086, p 641-643, May 1973. 1 fig, 2 tab, 12 ref.

Descriptors: *On-site tests, *Deep water, *Sea water, *Marine microorganisms, *Microbial degradation, *Organic matter, *Nutrients, Organic compounds, Methodology, On-site data collections, Radioactivity techniques, Spectrophotometry, Incubation, Carbohydrates.
Identifiers: *Enrichment, *Substrate, Utilization, Degradation products, Biotransformation, Paper, Ulva, Balsa wood, Beech wood, Casamino acids, Sodium acetate, Mannitol, Sodium glutamate, Liquid scintillation, Chemical recovery, Starch, Agars, Gelatin, Fate of pollutants.

Since microbial conversion of organic substrates was rather retarded when lab cultures and mixed populations of surface-born marine bacteria were incubated in the deep sea, it was assumed that microflora indigenous to the deep water or sediment would respond differently. To check this possibility, a housing for sterilized sample bottles was devised that permitted inoculation directly on the deep-sea floor. A rack holding 20 120-ml bottles was enclosed in a pressure-tight aluminum cylinder. As in earlier experiments, the bottles contained the media in concentrated form in quantities of 1 to 10 ml and were equipped with punctured serum caps for self-inoculation. This sample-housing vessel was attached to the research submarine Alvin. The samples were incubated at 1830 m depth and 4 C. The bottles filled at the incubation site contained 0.1 percent starch, 0.033 percent agar or 0.1 percent gelatin. After retrieval and poisoning with HgC12, starch, agar, and gelatin concentrations were determined. Sterile samples of bond paper, paper towels, balsa wood, beech wood, and Ulva thalli were incubated in separate bottles for 51 wk and their decomposition determined. 30, 10, 5 and 2 micrograms/ml of isotopically-labeled mannitol, sodium acetate, sodium glutamate, and casamino acids were also deposited for 14 wk and the degree of substrate conversion into cell material and CO2 was measured. Total recovery of labeled material averaged 97 percent. After inoculation of sterile organic materials on the deep-sea floor and in situ incubation for 1 year, relatively minute rates of microbial transformation were recorded. This extremely slow conversion rate, as well as the type and quantity of organic matter normally reaching the ocean floor, appear to characterize microbial life in the deep sea. (Holoman-Battelle)
W73-14446

CHLORINE AND TEMPERATURE STRESS ON ESTUARINE INVERTEBRATES,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
R. I. McLean.
Journal Water Pollution Control Federation, Vol 45, No 5, p 837-841, May 1973. 2 fig, 1 tab, 11 ref.

Descriptors: *Thermal stress, *Chlorine, Water pollution effects, *Laboratory tests, *Estuaries, *Chlorination, Animal populations, Crustaceans, Model studies, Water pollution, Copepods, Shrimp, Amphipoda, Mortality, Water temperature, Cooling water, *Invertebrates, Larvae, Heat resistance, *Thermal pollution, Bioassay, Marine animals.
Identifiers: Macroinvertebrates, Synergistic effects, Chemical concentration, Barnacles, Nauplii, Gammarus, Beach fleas, Melita nitida, Palaemonetes pugio, Chlorine residual, Grass shrimp.

Five species of estuarine invertebrates subject to entrainment in the cooling water system of a steam electric station were exposed experimentally to chlorine and temperature stresses simulating plant operations. Estuarine water was injected with chlorine gas to achieve a final concentration of 2.5 mg/l total chlorine residual. This concentration effected as high as 80 percent population mortality in the barnacle nauplii Balanus sp and 90 percent in the copepod Acartia tonsa during a 5-min exposure. Temperature elevations of 10 F (5.5 C) and 20 F (11 C) for 3 hr had no significant effect on population mortality. Two amphipods, Gammarus sp and Melita nitida, and one species of shrimp, Palaemonetes pugio, exhibited greater tolerance to the same stress conditions. (Holoman-Battelle)
W73-14447

ABOLITION OF SWARMING OF PROTEUS BY P-NITROPHENYL GLYCERIN: APPLICATION TO BLOOD AGAR MEDIA,
Iowa State Univ., Ames. Dept. of Bacteriology.
For primary bibliographic entry see Field 05A.
W73-14456

PLANT PHENOLS AND RELATED ORGANIC COMPOUNDS IN PUBLIC WATER SOURCES, THEIR RELATIONSHIP TO CHLORINATION,
Rhode Island Univ., Kingston. Dept. of Pharmacology.
For primary bibliographic entry see Field 05B.
W73-14468

INTERCEPTION AND DEGRADATION OF PESTICIDES BY AQUATIC ALGAE,
Rhode Island Univ., Kingston. Dept. of Pharmacology.
L. R. Worthen.
Available from the National Technical Information Service as PB-223 506, $2.75 in paper copy, $1.45 in microfiche. OWRR A-044-RI (1) 14-31-0001-3840

Descriptors: *Pesticide residues, *Degradation (Decomposition), *Algae, *Cyanophyta, Water pollution effects
Identifiers: *Pesticide degradation, Synechococcus elongatus

A method to quantitate the components of a two-component system which were unresolvable in a given gas chromatography system was developed. The method utilized the p-values of individual components. Blue-green algae from two streams in Rhode Island were examined for pesticide residue levels. In one case the levels of p,p'-DDT were 15-44 ppb dry weight of algae; the other was 1.8-18 ppb. Experiments indicated that Synechococcus elongatus accumulated within 24 hours virtually all of the p,p'-DDT added to the media. About 4% was metabolized to p,p'DDE which was found on the cell wall, none being detected within the cells. At a level of 0.99 ppm, the p,p'-DDT was not toxic to the organism.
W73-14469

WATER QUALITY AND CONSUMER COSTS.
Orange County Water District, Santa Ana, Calif.
For primary bibliographic entry see Field 06C.
W73-14536

CANADARAGO LAKE EUTROPHICATION: PHOSPHORUS ALONG A SECTION OF OCQUIONIS CREEK,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
R. J. Mumford.
Technical Paper Number 21, October, 1972. 87 p, 11 fig, 3 tab, 27 ref, 1 appendix.

Descriptors: *Eutrophication, *Phosphorus, *Data collections, *Water pollution sources, Phosphates, Fertilizers, Outfall sewers, New York, Waste identification, Pollutant identification, Streams.
Identifiers: *Canadarago Lake (New York).

In order to better understand the problems of eutrophication, a detailed demonstration study of Canadarago Lake is being performed by the New York State Department of Environmental Conservation. This lake is an eutrophic hard-water lake location in Otsego County, and has four major inlets. The phosphorus levels in a 5.8 mile section of Ocquionis Creek are documented. Phosphorus levels were studied because of their known contribution to the problem of eutrophication. It was desired to know how phosphorus levels changed along the length of the Creek to determine the sources of the phosphorus. Samples were taken above and below possible point sources, at changes in land use, near tributaries, etc. Samples were taken at periods of low flow and analyzed for particulate, soluble, and total phosphorus. No large phosphorus levels were found from agricultural lands, possibly due to the lack of surface runoff. Point sources (open sewers) changed the phosphorus level only slightly due to the dilution of the stream. More extensive data collections are seen as desirable. (Poertner)
W73-14537

LOUISIANA SUPERPORT STUDIES--REPORT 2, PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF A SUPERPORT ON THE SOUTHEASTERN COASTAL AREA OF LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 05B.
W73-14592

PURATION OF BILOXI BAY OYSTERS BY LAYING,
lf Coast Research Lab., Ocean Springs, Miss.
W. Cook, and G. W. Childers.
ailable from NTIS, Springfield, Va. 22151 as M-72-11177 Price $3.00, printed copy; $1.45 rofiche. Project report, June 1, 1972. 6 fig, 2 p, 1 tab, 4 ref.

scriptors: *Oysters, *Water pollution effects, eatment, *Bays, *Mississippi, Coliforms, ter quality, Sampling, Data collections, Comrcial shellfish, Shellfish farming, Environmenffects.
ntifiers: *Oyster relaying, Clean water, Oyster ansing.

he fall of 1966, the Microbiology Section of the lf Coast Research Laboratory launched a 3-r research project to study the problem of high iform counts in the waters over some of Mississpi's oyster reefs and to study the possibility of puration of oysters from closed area by relay-. Experimental depuration studies were conted in covered racks 30 x 18 x 3 inches, conucted of 1 inch welded wire mesh. Each rack acnmodated approximately 80 commercial size sters. Oysters were harvested with a hand dge, culled and placed in the rack and imdiately transferred to the depuration area. For dies of commercial relaying, the oysters were rvested by a power dredge boat and transported he depuration area and shoveled overboard. No ling was practiced. The glycogen content was asured on a composite sample from 10 oysters. all depuration studies, oyster samples were colted every other day after relaying and analyzed the coliform MPN and EC positive MPN. Baciological studies showed that the depuration of licator organisms from oysters was achieved in shorter time than the recommended 15 days. oodard-USGS)
73-14593

STORATION OF ALABAMA'S SUPPLY OF ED OYSTERS,
abama Dept. of Conservation and Natural sources, Montgomery.
r primary bibliographic entry see Field 02L.
73-14595

TUDENT PROJECTS ON COASTAL ZONE ND OFFSHORE RESOURCES MANAGEENT,
assachusetts Inst. of Tech., Cambridge.
r primary bibliographic entry see Field 02L.
73-14615

QUATIC INSECT COMMUNITIES IN THE VERS OF THE YORO, OBITSU, AND ISUMI, HIBA PREFECTURE, JAPAN, (IN APANESE),
eshwater Fisheries Research Lab., Tokyo apan).
r primary bibliographic entry see Field 05B.
73-14617

NVIRONMENTAL EFFECTS OF HYDRAULIC REDGING IN ESTUARIES,
labama Marine Resources Lab., Dauphin Island.
B. May.
labama Marine Resources Bulletin No. 9, p 1-85, pril 1973. 27 fig, 13 tab, 100 ref. NOAA PL 88-09, Proj. 2-149-R.

escriptors: *Environmental effects, *Dredging, Estuaries, Ecology, Benthos, Hydrology, *Water uality, Biomass, Rivers, Estuarine environment, hannel improvement, Salinity, Circulation, Sediment transport, *Waste disposal, Sedimentaon, Turbidity, *Alabama.
lentifiers: Spoil disposal.

Hydraulic channel and shell dredging and open water spoil disposal have little significant immediate effect on water quality in Alabama estuaries. Almost all of the sediment discharged by dredges settles very rapidly and is transported by gravity along the bottom as a separate flocculated density layer and potentially harmful components of the mud are not dissolved into the water. There is a limited, temporary reduction in benthic organisms in areas affected by dredging. Spoil piles from channel dredges can indirectly affect the ecology and usefulness of estuaries by interfering with water circulation and altering salinity. The basic hydrological concepts which determine the effects of dredging should be applicable in other areas. Extensive regulations appaently are not necessary to protect water quality in open water dredging situations but spoil disposal practices from channel dredges must be reconsidered and appropriate new disposal plans developed. (Sinha-OEIS)
W73-14621

INFORMATION ON THE STUDY OF PHYTOPLANKTON OF THE HIGHER PART OF THE VORSKLA RIVER, (IN RUSSIAN),
Leningrad State Univ. (USSR).
A. S. Shaaban.
Vestn Leningr Univ Ser Biol. Vol 26, No 4, p 70-78, 1971. Illus. English summary.
Identifiers: Chlorophyta, Cyanophyta, Diatoms, Euglenophyta, *Phytoplankton, Rivers, Seasonality, *USSR (Vorskla River).

Phytoplankton of the Vorskla river (USSR) were studied in Borisovka, Belgorod region for 6 mo., from April to Sept. 1969. One hundred eighty-seven taxa of algae from 8 systematic groups were identified. Phytoplankton of the river sustains its diatom character during the period of material collection, but it was found that in summer a considerable growth of Chlorophyta, Cyanophyta and Euglenophyta occurred. It was shown that at the investigation point, phytoplankton had a fresh oligosaprobic character with inclination toward B-mesosaprobic in summer.--Copyright 1973, Biological Abstracts, Inc.
W73-14626

EXPERIMENTAL DATA FOR SUBSTANTIATING THE RESIDUAL CONCENTRATIONS OF CHLORINE DIOXIDE IN DRINKING WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
S. A. Fridlyand, and G. Z. Kagan.
Gig Sanit. Vol 36, No 11, p 18-21, 1971. Illus. (English summary).
Identifiers: *Chlorine dioxide, Rats, Residuals, *Potable water, *Toxicity, Organoleptic properties.

The intoxication of rats with chlorine dioxide in doses of 0.5 and 5 mg/kg (10 and 100 mg/l) produced a pronounced toxic and resorptive effect. Residual concentrations in the drinking water are suggested by the compounds effect on the organoleptic properties of water.--Copyright 1973, Biological Abstracts, Inc.
W73-14707

5D. Waste Treatment Processes

GUIDE TO THE PREPARATION OF OPERATIONAL PLANS FOR SEWAGE TREATMENT FACILITIES,
Synectics Corp., Allison Park, Pa.
E. L. Seiler, and J. W. Altman.
Copy available from GPO Sup Doc as EP1.23/2:73-263, $2.60; microfiche from NTIS as PB-223 346, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-263, July 1973. 212 p, 39 fig, 14 tab. EPA Project 1709 FWA. Contract 68-01-0073.

Descriptors: *Management planning, *Operations research, *Operation and maintenance, *Optimization, Manpower, Systems engineering, Human resources, Operations, Publications, *Treatment facilities, Wastewater treatment, Sewage treatment.
Identifiers: Job aids, Performance standards, Performance aids, Management data, Operator data, maintenance data, *Human engineering, Job analysis.

A proceduralized methodology is provided to guide the initial and ongoing planning necessary for extracting maximum potential from wastewater treatment plants. The objective of the planning activities is the development of conceptual and applied tools for direct use by plant personnel in optimizing the cost-effectiveness of their plant, complementing the design engineering of the physical plant. The main body of the Guide is divided into five major steps, representing a proceduralized methodology for developing operational planning materials. The contents and sequencing of these steps are designed to rationally combine operational planning and design engineering. Heavy emphasis is placed on general methods and principles which can be applied to a wide variety of specific treatment plant designs and situations. The four appendixes of the Guide provide a detailed classification and description of planning materials deemed essential to plant functions of management, operations, and maintenance. Job descriptions, plant manuals, checklists, reference materials, task schedules, decision tables, and operating records are among the specific materials designed to support the above personnel functions. Thus, the appendixes serve to define the nature of the planning outputs while the five procedural steps of the main body provide a framework for their development. (EPA)
W73-14214

PREDICTING AND CONTROLLING RESIDUAL CHLORINE IN COOLING TOWER BLOWDOWN,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg. National Thermal Pollution Research Program.
G. R. Nelson.
Copy available from GPO Sup Doc as EP1.23/2:72-273, $0.80; microfiche from NTIS as PB-223 378, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-273, July 1973. 48 p, 12 fig, 11 ref.

Descriptors: *Chlorination, *Chlorine, *Water treatment, *Cooling towers, *Mathematical models, Recirculated water, Biocontrol, Chemcontrol, Monitoring, Forecasting.
Identifiers: *Blowdown control, Residual chlorine, Splitstream chlorination.

A mathematical model which predicts and controls residual chlorine levels in cooling tower blowdown is developed and analyzed. The model has eight variations to allow for (a) the fraction of the recirculating water chlorinated, (b) the type of chlorine feed equipment used, and (c) the time length of the chlorine feed period. The variations to the model are useful not only in predicting residual chlorine levels in the blowdown, but also in making alterations in existing chlorination programs which minimize chlorine waste, provide more disinfecting efficiency, and reduce residual chlorine levels in the blowdown. (EPA)
W73-14215

ELECTRICAL POWER CONSUMPTION FOR MUNICIPAL WASTEWATER TREATMENT,
National Environmental Research Center, Cincinnati, Ohio. Advance Waste Treatment Research Lab.
R. Smith.
Copy available from GPO Sup Doc as EP1.23/2:73-281, $1.25; microfiche from NTIS as PB-223 360, $1.45. Environmental Protection

Agency, Technology Series Report EPA-R2-73-281, July 1973. 89 p, 14 fig, 15 tab, 12 ref. EPA Program Element 1B 2043.

Descriptors: *Waste water treatment, *Electrical power demand, *Electric power costs, Sewage treatment, Sewage, Cost comparisons, Treatment facilities, Municipal water.
Identifiers: *Electrical power consumption.

Electrical power consumption by most conventional and advanced processes for treating municipal wastewater has been estimated on a unit process basis. Electrical power for complete plants has been estimated by adding power consumption for individual processes and plant utilities. Electrical power consumption for wastewater treatment has been compared to other consumptive uses of electrical power. (EPA)
W73-14216

STUDY OF UPFLOW FILTER FOR TERTIARY TREATMENT,
Jefferson Parish Dept. of Sanitation, Metairie, La.
J. E. Morrison.
Available from the National Technical Information Service as PB-223 354, $5.25 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report EPA-670/2-73-074, September 1973. 62 p, 19 fig, 2 tab. EPA Project 17030 DMA.

Descriptors: *Filtration, *Tertiary treatment, *Sand filters, Separation techniques, Sewage treatment, *Waste water treatment.
Identifiers: *Upflow filter, *Suspended solids removal, Upgrading secondary effluent.

A sand-media upflow filter was installed at an existing trickling filter sewage treatment plant which receives combined domestic and industrial waste, to test its effectiveness in a tertiary treatment function. Preliminary testing was performed at three different flow rates and with different chemicals as flocculants and coagulant aids to determine optimum conditions for final, full-scale testing. In the final, full-scale test phase, a flow rate equivalent to 0.5 MGD was used, and alum was injected as required to produce satisfactory turbidity levels in filter effluent. The operation was monitored constantly for flow rate, inlet pressure, water temperature and alum input; influent and effluent values for turbidity, suspended solids, BOD, COD, total phosphate, orthophosphate and pH were determined. Filter performance was inconsistent and generally unpredictable. Alum as a coagulant was effective as an aid in contaminant reduction; however, the alum floc proved weak and its use resulted in short filter cycles. Polyelectrolytes used as coagulant aids to the alum proved ineffective in developing floc strength and extending the cycle duration. (EPA)
W73-14217

SLUDGE PROCESSING FOR COMBINED PHYSICAL-CHEMICAL-BIOLOGICAL SLUDGES,
Brown and Caldwell, Inc., San Francisco, Calif.
D. S. Parker, F. J. Zadick, and K. E. Train.
Copy available from GPO Sup Doc as EP1.23/2:73-250, $2.10; microfiche from NTIS as PB-223 341, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-250, July 1973. 141 p, 54 fig, 28 tab, 23 ref. EPA Project 17080 FSF. R801445.

Descriptors: *Sludge disposal, *Sludge treatment, Ultimate disposal, *Dewatering, Chemical precipitation, *Sludge digestion, Centrifugation, Solid wastes, *Waste water treatment.
Identifiers: *Chemical sludge processing, Centrifugal classification, Centrifugal dewatering, Recalcination, Chemical treatment.

Full scale combined sludge generation from a treatment sequence consisting of lime clarification, nitrification, and dentrification was studied. Pilot scale studies were conducted to wet-classify and dewater the combined sludges by means of two-stage solid bowl centrifugation. Anaerobic digestion of first stage centrate was also studied on a pilot scale. Predicted and measured sludge production agreed well using four coagulation modes in the primary. First stage centrifugation (wet classification), over a wide pH range, achieved high capture of calcium carbonate in relatively dry (42 to 57 percent total solids) cakes as well as good rejection of magnesium, phosphorus, and iron compounds in the centrates. At pH 11.0 or below, second stage centrifugation dewatered first stage centrate to produce 18 percent total solids cakes, with 80 percent solids recoveries. Dewatering deteriorated at a pH greater than 11.0. Anaerobic stabilization of thickened and unthickened first stage centrates showed volatile matter destructions of over 40 percent, high methane-content gas, and substantial increases in soluble magnesium and alkalinity during digestion. This investigation was a joint effort of the Central Contra Costa Sanitary District, Walnut Creek, California, and its consultant, Brown and Caldwell. (EPA)
W73-14218

DENTRIFICATION BY ANAEROBIC FILTERS AND PONDS - PHASE II.
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.

Bio-Engineering Aspect of Agricultural Drainage, San Joaquin Valley, California, June 1971. 34 p, 12 fig, 4 tab, 6 ref. EPA Project 13030 ELY 06/71-14.

Descriptors: *Agricultural wastes, *Dentrification, *Irrigation water, Return flows, Nitrate, Anaerobic treatment, *Waste water treatment, *California, Filters, Filtration.
Identifiers: *San Joaquin Valley (Calif), Bacterial dentrification, *Anaerobic filters, Anaerobic ponds.

Operational criteria, design and operations costs for a treatment facility to remove nitrogen from agricultural tile drainage in the San Joaquin Valley were further investigated during 1970 at the Interagency Agricultural Wastewater Treatment Center near Firebaugh, California. The year-long study period is identified as Phase II. Based on projected nitrate-nitrogen concentrations for valley tile drainage water, the research in this phase extended earlier Phase I studies on the feasibility of bacterial dentrification by filters and covered ponds. The anaerobic filter with 1-inch rounded aggregate was capable of reducing influent nitrate-nitrogen from 30 mg/l at water temperatures from 12 to 16C at a 6-hour detention time, and from 15 mg/l to 2 mg/l at water temperatures of 10 to 24C at 1-hour detention time. Long-term operation of filters resulted in accumulation of bacterial mass which caused the deterioration of the hydraulic regime and nitrogen removal efficiencies. Air scour accompanied or followed by flushing with water was capable of controlling the bacterial mass. The consumptive ratio, a method to quantify the organic carbon source needed for anaerobic bacterial process, was affected by temperature and influent nitrogren concentration and was found to vary between approximately 1.2 and 2.4. The anaerobic covered pond reduced influent nitrate-nitrogen from 30 mg/l to mg/l at water temperatures of 12 to 16C with a 60-day detention time and from 15 mg/l to 2 mg/l at 20 to 2-C with a 10-day detention time. (Jones-EPA)
W73-14219

INSTREAM AERATION TO CONTROL DISSOLVED SULFIDES IN SANITARY SEWERS,
Jefferson Parish Dept. of Sanitation, Metairie, La.
K. L. Condon, Jr., R. A. Cooper, Jr., and A. J. England, Jr.
Available from the National Technical Information Service as PB 223 342. $3.25 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report EPA 670/2-73-024, September 1973. 92 p, 34 fig, 6 tab, 10 ref. EPA Project 17010 ELP WPRD 121-01-68.

Descriptors: *Sulfides, *Odor, *Corrosion control, Aeration, Sewers, *Waste water treatment, Oxygen demand.
Identifiers: *Sulfide oxidation, Upstream aeration, Aspirators, *Instream aeration, Venturi aspirated U-tubes, Oxygen transfer.

Field studies were conducted employing full scale prototypes of four aeration devices installed in a sanitary sewage collection system. The devices used included an in-line Venturi aspirator, an in-line Vortex Shear aspirator, an air lift pump, and Venturi aspirated U-tubes. Only the Venturi aspirated U-tubes proved to be satisfactory under the conditions of this study. The U-tube installed on the end of a sewage force main reduced dissolved sulfides, at a sampling station 1500 ft downstream, from .03 mg/l to .02 mg/l (equivalent to a 12 min detention). Additionally, the U-tube virtually eliminated the stripping of H2S in the discharge manhole where a severe odor problem and corrosive attack had existed. Oxygen demand in the force main immediately upstream of the U-tube averaged 2.5 mg/l. Oxygen transfer in the U-tube averaged 5.1 mg/l with residual dissolved oxygen in the effluent averaging 2.6 mg/l. As installed, and with oxygen transfer averaging 5.1 mg/l, no modification of existing pumps was required. Higher transfer concentrations approaching 7 mg/l were obtained with Venturi aspiration, but resulted in increased pump head requirements. Transfer concentrations up to 8 mg/l were obtained with forced air injection, but did not appear to justify the added cost of blowers and greatly increased pump head requirements. No maintenance was required on either of the two Venturi aspirated U-tubes during two years of continuous operation in this demonstration. This report was submitted in fulfillment of a grant to the Department of Sanitation, Jefferson Parish, Metairie, Louisiana. (EPA)
W73-14220

SLUDGE CONDITIONING USING SO2 AND LOW PRESSURE FOR PRODUCTION OF ORGANIC FEED CONCENTRATE,
Snell (Foster D.), Inc., Florham Park, N.J.
M. S. Weinberg, H. K. Weiss, A. L. Palanker, and A. L. Sheffner.
Available from the National Technical Information Service as PB-223 343, $10.50 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report EPA-670/2-73-062, September 1973. 155 p, 11 fig, 119 tab, 11 ref. EPA Project 17070 EKN, Contract 14-12-813.

Descriptors: *Activated sluge, *Sewage treatment, *Sewage sludge, *Dewatering, *Sulfur compounds, Filtration, Chemical degradation, Municipal wastes, Sulfur dioxide, *Waste water treatment, Cost analysis.
Identifiers: Animal feed supplement, Reproductive performance, Nutritional value, Treatment costs, Teratogenic effects, Organic feed concentrates.

Activated sludge from four municipal sewage plants was treated with 0-5%SO2 at pressures of 50-100 psig. The filterability of the treated sludges was improved and the treatment solubilized from 26 to 44% of the initial insoluble solids. The clear, light yellow filtrates were concentrated and then spray-dried to flowable, hygroscopic, tan powders having nutritional value as an animal feed supplement. Capital investment and manufacturing costs for a plant producing 900 tons per year of a 50% concentrate or 450 tons per year of dry product was estimated at $223,000 and $273,000 with manufacturing costs of 6. 1 cent and 13.2 cent per pound respectively. Effects on reproductive per-

formance of this organic feed concentrate (OFC) were investigated in rats, rabbits and chickens using nutritionally balanced diets. No teratogenic effects were seen in rats or rabbits fed 5% or 10% OFC. No alterations in reproductive parameters wee noted in rats fed 5% OFC. Increased food intake and body weight gains were observed (5% OFC male and female rats) during the pre-mating feeding period. At 10% OFC levels, reduced Fertility, Viability and Lactationindexes were seen in rats and egg laying performance of chickens was suppressed. (EPA)
W73-14222

RENOVATING SEWAGE EFFLUENT BY GROUNDWATER RECHARGE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
Herman C. Bouwer, J. C. Lance, and R. C. Rice.
In: Proceedings, 16th Annual Water Conference, New Mexico Water Resources Research Institute, Las Cruces, March 25-26, 1971, p 32-46, 3 fig, 2 tab, 14 ref.

Descriptors: *Groundwater recharge, *Water reuse, *Hydrogeology, *Waste water treatment, Activated sludge, Biochemical oxygen demand, Chemical oxygen demand, Phosphates, Nitrates, Boron, Ammonia, Infiltration, Cost analysis, Pilot plants.
Identifiers: *Groundwater table, *Inundation, Fluorides.

Continued population growth in the Salt River Valley has stimulated interest in systems for reuse of municipal sewage effluent. Pilot plant studies of groundwater recharge of municipal activated sludge effluent were initiated in 1967. The secondary effluent contained 15 mg/l BOD, 50 mg/l COD, 25 ppm ammonia nitrogen as N, 13 ppm phosphate, and 4.5 ppm fluorides. The river bed, through which the water passed, was composed of 3 ft. of the fine loamy sand underlain by sand and gravel layers to great depth, with a groundwater table at about 10 ft. Water was pumped from one 30 ft. deep well in the center of the infiltration area, and from another well 1000 ft. from the center of the infiltration basins. Reclaimed water pumped from the well in the center of the infiltration area contained 0.5 mg/l BOD, 17 mg/l COD, no ammonia nitrogen for short (2-3 day) inundations and 40 to 80% less than influent NH3-N concentrations for 2 to 3 week inundations, 5 ppm phosphates, 2.5 ppm fluorides, and a median fecal coliform density of 10 per 100 ml. Concentrations of most constituents were further reduced by horizontal travel. Cost of the system was estimated at $5/acre-ft. with minimum underground travel distance and detention time of 500 ft. and 1 month respectively. Cost of conventional, in-plant tertiary treatment was reported as more than 10 times the estimate cost for groundwater recharge treatment. (See also W73-14224) (Lowry-Texas)
W73-14225

MATHEMATICAL SIMULATION OF AMMONIA STRIPPING TOWERS FOR WASTEWATER TREATMENT,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. F. Roesler, R. Smith, and R. G. Eilers.
Available from National Technical Information Service, Springfield, Va., 22151 as PB-220 057, $3.00 in paper copy, $1.45 microfiche. FWQA Report, January 1970. 73 p, 17 fig, 3 tab, 27 ref. EPA Project 17090--1/70.

Descriptors: Water pollution, *Waste water treatment, Capital costs, *Sewage treatment, Operating costs, Maintenance costs, Sanitary engineering, Ammonia, Mathematical models, Simulation analysis, Model studies, *Tertiary treatment, *Cooling towers, *Computer programs.
Identifiers: *Ammonia stripping towers, Unit process models.

This computer program (FORTRAN, IBM 1130) can be used for preliminary design and cost estimation of ammonia stripping towers and cooling towers used in the treatment of wastewater. Crosscurrent and countercurrent tower configurations are included in the program. This mathematical model considers the effect of temperature drop thoughout the stripping tower. Capital and operation and maintenance costs are also calculated. (EPA)
W73-14229

WATER DISTRIBUTION AND WASTEWATER COLLECTION SYSTEMS IN FORSYTH COUNTY, NORTH CAROLINA WITH URBAN DEVELOPMENT FORECASTS: 1968-1978-2010.
City-County Planning Board, Winston-Salem, N.C.

July 1968. 52 p, 9 fig, 21 tab, 3 append.

Descriptors: *Water supply, *Waste water disposal, Sewage disposal, Septic tanks, Planning, *North Carolina, Treatment facilities, *Sewers, Utilities, *Waste water treatment, Urbanization, Cities.
Identifiers: *Utilities extension, Winston-Salem (N.C.), Forsyth County (N.C.).

The case for public sewers serving Forsyth County is built primarily upon potential health hazards of septic tanks throughout urbanizing areas. Time, increased density, and poor soils in developing districts will increase the danger of septic tank failure. Existing and programmed water supply programs are described, as well as existing waste water disposal systems. It is recommended that water not be provided to any areas in the absence of a wastewater disposal system. A unified county approach is urged for provision of these services. Because of the financial infeasibility of servicing outlying districts, the study urges that development in these districts be discouraged by strict utility policy and land regulations. The study defines and proposes an approximate public utilities district for the county, based on considerations of population projections and drainage patterns. Consideration is given to financing utilities extension. (Stein-North Carolina)
W73-14233

LANCASTER COUNTY, PENNSYLVANIA, COMPREHENSIVE SEWERAGE PLAN.
Huth Engineers, Inc., Lancaster, Pa.
For primary bibliographic entry see Field 05G.
W73-14234

CITY OF ESCONDIDO AND VISTA IRRIGATION DISTRICT FEASIBILITY STUDY OF JOINT FILTRATION PROGRAM.
Montgomery (James M.), Inc., La Jolla, Calif.
For primary bibliographic entry see Field 05F.
W73-14240

TOXICITY ASSESSMENT OF TREATED MUNICIPAL WASTEWATERS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05C.
W73-14258

MICROBIOLOGY OF WASTE TREATMENT,
Pennsylvania State Univ., University Park.
R. F. Unz.
Journal Water Pollution Control Federation, Vol 45, No 6, p 1259-1265, June 1973. 67 ref.

Descriptors: Waste water (Pollution), *Nutrient removal, *Microorganisms, *Bibliographies, *Microbial degradation, Pollutant identification, *Reviews, *Microbiology, Waste treatment, Sewage treatment, Growth rates, Algae, Rotifers, Protozoa, Organic matter, Viruses, Proteins, Carbohydrates, Phenols, Sewage sludge, Scum, Pseudomonas, Activated sludge, Alcohols, Organic acids, Systematics, Sulfides, Cultures, Coliforms, Biochemical oxygen demand, Chemical oxygen demand, Phosphorus, Nickel, Heavy metals, Nitrogen, Nutrients, Flocculation, Nematodes, Amino acids, Iron, Hydrogen sulfide, Waste treatment, Denitrification, Oxidation, Nitrification, Acetates, Formates, Hydrogen, Methane, Carbon, Lipids, Aluminum, Chlorination, Chlorine, Salmonella, E. coli, Sulfates, Humic acids, Bacteriophage.
Identifiers: Survival, Inactivation, o-Cresol, m-Cresol, p-Cresol, Benzoates, m-Toluate, p-Toluate, Zoogloea ramigera, Achromobacter, Alcaligenes, Aerobacter, RNA, DNA, Polysaccharides, Sporosarcina ureae, Agars, Thiothrix, Culture media, Formic acid, Arsenic, Ciliates, Rhizopods, Aspidisca costata, Aspidisca lynceus, Pseudomonas denitrificans, Bacillus, Psychoda, Sugars, Enrichment, Fatty acids, Valerate, Caproate, Polysaccharides, Pseudomonas aeruginosa, Polioviruses, Coxsackie viruses, Salmonella paratyphi, Tetrahymena pyriformis, Acanthamoeba hartmanella, Shigella flexneri, Fecal coliforms, Mycobacterium, Desulfovibrio desulfuricans.

The 1972 literature is reviewed on the identification of microorganisms in wastewaters and their abilities to degrade or remove pollutants and nutrients. Optimum conditions for growth of the organisms are also considered. (Little-Battelle)
W73-14261

DISCHARGE OF NITRILOTRIACETATE (NTA) FROM TWO SEWAGE TREATMENT FACILITIES LOCATED IN A MIDCONTINENTAL CLIMATE,
Fisheries Reasearch Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05B.
W73-14294

PROTEINS IN WASTEWATER AND WASTEWATER SLUDGES,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
For primary bibliographic entry see Field 05A.
W73-14311

DETERGENTS,
Matz, Childs, and Associates, Baltimore, Md.
For primary bibliographic entry see Field 05B.
W73-14319

FACTORS INFLUENCING THE FREQUENCY OF SAMPLING.
PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-14324

FEASIBILITY STUDY OF A NUCLEAR POWER-SEWAGE TREATMENT SYSTEM FOR THE CONSERVATION AND RECLAMATION OF WATER RESOURCES,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
R. A. Sierka.
Available from the National Technical Information Service as PB-223 501, $2.75 in paper copy, $1.45 in microfiche. Completion Report, August 1973. 12 p, 2 fig, 3 tab, 3 ref. OWRR A-028-ARIZ (2). 14-31-0001-3503.

Descriptors: *Waste water treatment, *Sewage treatment, Reclaimed water, *Thermal pollution, Nuclear Powerplants, *Activated carbon.
Identifiers: *Heated Sewage.

Seventy percent of the energy produced in a nuclear power reactor is rejected to the environment as low quality heat. One possible use of this heat source is for domestic wastewater treatment. This study examined a ferric-chloride, powered activated carbon and an aluminum sulfate, powered activated carbon physical-chemical system in a one-step process as a function of temperature (20-80C). COD, suspended solids, turbidity and phosphorus removals were used to monitor performance. Significant improvement in pollutant removals was obtained at higher temperatures with the optimum results occurring between 50 and 60C. Since urban wastewater flow and electric power usage are population-dependent and the system optimum treatment temperature coincides with waste heat characteristics, a combined power plant-wastewater system would generate recycle water.
W73-14360

PHOSPHORUS REMOVAL BY TRICKLING FILTER SLIMES,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
A. E. Zanoni.
Copy available from GPO Sup Doc as EP1.23/2, 73-279, $2.10; microfiche from NTIS as PB-223 534, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-279, July 1973. 122 p, 4 fig, 24 tab, 40 ref. EPA Project 17010 DZG.

Descriptors: *Phosphorus, *Biological treatment, Nutrients, *Slime, Minerals, *Waste water treatment, Equipment, Trickling filters, Nitrogen, Metabolism.
Identifiers: Attached growth, Synthetic media, Research apparatus.

A rotating disc apparatus was constructed so that disc speed could be varied. Organisms that developed on the disc surface, in response to various nutrient solutions, could be harvested and analyzed. Correlations were attempted between mineral composition of the feed solutions and the phosphorus and nitrogen content of the resulting slimes. An inclined channel apparatus was also constructed and evaluated to differentiate physical or chemical mechanisms from biological mechanisms of phosphorus uptake. The angle of inclination was used to measure the kinetic rates before and after inactivation of the biological slime with ultraviolet light. With the disc apparatus, limited success of inducing biological uptake of phosphorus, in excess of 1.5 to 2.5 percent of the cell mass, was obtained. Statistical analysis of the data indicated that those values above 2.5 percent usually were encountered when the medium contained calcium salts. Results from the inclined plane growth chamber showed that the limited phosphorus uptake that did occur could be related to metabolic activity rather than physical sorption or chemical precipitation. (EPA)
W73-14372

PRESSURE FILTRATION OF WASTE WATER SLUDGE WITH ASH FILTER AID,
Cedar Rapids Water Pollution Control Plant, Iowa.
J. W. Gerlich.
Copy available from GPO Sup Doc as EP1.23/2, 73-231, $2.10; microfiche from NTIS as PB-223 535, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-231, June 1973. 153 p, 64 fig, 14 tab. EPA Project 11060 EZX.

Descriptors: Sludge, *Dewatering, *Iowa, *Sludge treatment, Filters, *Waste water treatment, Pressure, *Filtration.
Identifiers: Ash filter aid, *Pressure filtration, Cedar Rapids (Iowa).

Cedar Rapids, Iowa used pilot plant studies as an effective approach to an economic solution to dewatering secondary digested sluge After piloting several dewatering processes, the pressure filter system was selected and a full scale plant was constructed. During the course of the dewatering studies it was observed that fly ash was an effective filter aid. The full scale plant was designed to utilize sludge ash from incinerated filter cake, as well as power plant fly ash. The design capacity is 28 tons of dry sewage solids for 16 hour operation at 48 percent dry solids cake. Performance data from the full scale plant were evaluated over a period of approximately nine months. Both fly ash and sludge ash were evaluated as a filter aid, with and without chemicals. Economic evaluations were made of operation and equipment. Some conclusions are: (1) Pressure filtration of waste water sludges is an effective and economical process. (2) Ash filter aid increases dewatering production and decreases chemical costs. Sewage sludge ash from an incinerator can be recycled to process; power plant fly ash is even more effective sludge conditioner. (3) A detailed pilot plant program is of great value in design of a full scale plant. (4) Some chemicals in combination with ash filter aid further improve dewatering efficiencies. (EPA)
W73-14374

REVERSE OSMOSIS FOR WASH WATER RECOVERY,
Envirogenics Systems Co., El Monte, Calif.
R. W. Lawrence.
Available from the National Technical Information Service as PB-220 389, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No. 848, May 1973. 24 p, 4 fig, 6 tab. OSW contract 14-30-2815.

Descriptors: *Water reuse, *Reverse osmosis, *Water purification, Separation techniques, Membranes, Pressure, Water treatment, Detergents, Flocculation, *Pre-treatment (Water), *Waste water treatment, Recovery, Filtration.
Identifiers: Wash water, Laundry wash water, Spiral module, Wash water analysis, Alum flocculation, Cellulose acetate membranes.

A 34-day run was made at 165F under an operating pressure of 800 psig with the synthetic wash water containing 1000 ppm sodium lauryl suflate. The flux decline parameters were 0.17 and 0.067 for blend and cellulose acetate methacrylate (CAM) membranex, respectively, and the extrapolated flux at six months were 13 and 19 gfd, respectively. The rejections obtained with blend and CAM membranes were low for urea (37 to 46%), strongly pH dependent for lactic acid (84 to 98%), good for sodium lauryl sulfate (92 to 98%) and excellent for sodium chloride (99.4% for blend membrane and 98.9% for CAM membrane). Many tests on the bacterial content of the product water and the recycle stream when operating at 165F showed that they were sterile. This proved to be true for both synthetic and real wash water. A 2-in. dia. by 22-in. spiral module containing 4.5 sq ft of blend membrane was operated satisfactorily for 30 days at 165F, 400 psig, and 64-77% product recovery. The membrane support was stiffened by the use of Mylar sheet between two pieces of Dacron-tricot substrate. Pretreatment of the wash water consisted of filtration through 30, 23 and 0.45 micron fulted filters. Sulfuric acid was added periodically to keep the pH between 6 and 8.5. Increasing the flow rate from 0.5 gpm to 0.9 gpm daily aided maintaining product flux, which was initially 12.0 and 6.5 gfd at the end of 30 days operation. (OSW)
W73-14387

A PILOT PLANT INVESTIGATION OF THE PULSED ADSORPTION BED PROCESS,
Iowa State Univ., Ames.
S. R. Sedgewick.
Master's Thesis, 1969, 138 p, 37 fig, 12 tab, 13 ref.

Descriptors: *Adsorption, *Tertiary treatment, *Organic loading, Efficiencies, Biodegradation, Separation techniques, Colloids, *Pilot plants, *Waste water treatment
Identifiers: *Pulsed adsorption beds, Hydraulic loading, *Total organic carbon, Suspended solids

A pulsed adsorption bed (PAB) pilot plant was operated for 82 days to determine (1) the relationship between influent total organic carbon and removal efficiency at various hydraulic loadings, (2) if a relationship exists between influent soluble fraction and hydraulic loading; and (3) if relationships exist between removal efficiency of the influent solid plus colloidal fraction and hydraulic loading. Organic loadings of 97, 161, and 223 lb BOD applied/1000ft3/day at respective hydralic loadings of 0.70, 1.15 and 1.60 gpm/ft2 were applied to the system. For both the total and colloidal plus suspended samples, highest total organic removal efficiency was obtained at the lowest hydraulic loading rate investigated and conversely, while removal efficiency for the soluble fraction was essentially constant at all hydraulic loadings. In addition, the non-biodegradable fraction of the waste appeared to increase with increased hydraulic loading. Overall, an increase in removal efficiency was shown to occur with an increase in influent concentration, with such increase being highly dependent upon the concentration of the non-degradable portion of the influent. Areas requiring further study include relationships between removal efficiency and both bed depth and air flow rate, as well as cost estimates. (Lowry-Texas)
W73-14389

CANADA ANIMAL WASTE MANAGEMENT GUIDE.
Department of Agriculture, Ottawa (Ontario). Animal Waste Management Guide Committee.
For primary bibliographic entry see Field 05G.
W73-14392

INFLUENCE OF SURFACE OXIDES ON ADSORPTION AND CATALYSIS WITH ACTIVATED CARBON,
Maryland Univ., College Park. Dept. of Civil Engineering.
C. Ishizaki, and J. T. Cookson, Jr.
Available from ACS-Div of Water, Air and Waste Chem., Publications Manager, Mellon Inst., 4400 Fifth Aven., Pittsburgh, Pa. 15213, Price $4.00. In: Preprints of Papers Presented at 165th National Meeting of American Chemical Socieyt, April 8-13, 1973, Dallas, Tex: American Chemical Society, Division of Water, Air and Waste Chemistry, Vol 13, No 1, Paper 53, p 51-53, 1973.

Descriptors: *Adsorption, *Water treatment, *Organic compounds, *Activated carbon, Water purification, *Waste water treatment, Organic wastes.
Identifiers: Mercaptans, Disulfides, Hydrocarbons.

The influence of surface oxides is evaluated for the adsorption of several organics on Filtrasorb 200, an activated carbon. The absorbates include p-hydroxybenzaldehyde (representative of degradation products of larger color-producing compounds), n-butyl mercaptan and butyl disulfide (paraffinic molecules found responsible for taste and odor problems in water), decane (a nonpolar molecule), and glycine (a polar compound). The surface of the carbon, originally basic in nature, is modified by outgassing followed by dry oxidation at several temperatures. Equilibrium as well as kinetic studies were performed in batch systems. For all the adsorbates studied the equilibrium can be described by the Langmuir equation. The monolayer coverages are in the order of a few millimoles per square meter. The activated carbon was found to catalyze the oxidation of n-butyl mercaptan to butyl disulfide. A mechanism is proposed to explain this catalytic effect. The rates of adsorption are studied for all the

adsorbates. The presence of acidic surface oxides strongly hinders the adsorption of decane and butyl disulfide, but it does not seem to influence the adsorption of the aromatic. (Knapp-USGS)
W73-14394

KINETICS OF VIRAL INACTIVATION BY BROMINE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05F.
W73-14395

THE DISINFECTION OF SEWAGE BY CHLOROBROMINATION,
Dow Chemical Co., Midland, Mich. Hologens Research Lab.
J. F. Mills.
Available from ASC-Div of Water, Air and Waste Chem., Publications Manager, Mellon Inst., Fifth Ave., Pittsburgh, Pa. 15213, Price $4.00. In: Preprints of Papers Presented at 165th National Meeting of American Chemical Society, April 8-13, 1973, Dallas, Tex: American Chemical Society, Division of Water, Air and Waste Chemistry, Vol 13, No 1, Paper 71, p 65-75, 1973. 3 fig, 2 tab, 10 ref.

Descriptors: *Bromine, *Bromides, *Disinfection, *Sewage treatment, *Waste water treatment, Toxicity, Fish.
Identifiers: *Bromamines, *Chloramines.

The chemical and biocidal properties of bromine chloride and the instability of bromamines in sewage make chlorobromination an attractive alternative to chlorination and a potential solution to this problem. In comparing chlorination and chlorobromination of secondary sewage effuent versus nitrified secondary sewage effluent, the effects of ammonia concentration, pH, temperature, halogen dosages, and halogen demand are important factors influencing both biocidal activity and fish toxicity. Some of the conclusions are: BrCl forms less stable bromamine residuals; BrCl shows higher biocidal activity without fish toxicity hazards: BrCl is more effective over a wider pH range; and BrCl has advantageous chemical and physical properties (higher solubility and lower volatility). (Knapp-USGS)
W73-14396

WASTEWATER CONVEYANCE MODELS,
For primary bibliographic entry see Field 05G.
W73-14465

HAZARDS ASSOCIATED WITH THE USE OF CHLORINATED OXIDATION POND EFFLUENTS FOR IRRIGATION,
Technion - Israel Inst. of Tech., Haifa.
Y. Kott.
Water Research, Vol 7, p 853-862, 1973. 7 tab, 17 ref.

Descriptors: *Chlorination, Effluents, Hazards, *Irrigation water, *Oxidation lagoons, Water quality control, *Water reuse, Water treatment, *Waste water treatment.
Identifiers: *Israel.

In Israel more than 200 oxidation ponds are in use, most of them serving rural communities. It is natural to assume, therefore, that in a country where about 90 percent of the water resources are utilized, most of the oxidation pond effluents will be used for irrigation. Reuse of wastewater for agricultural purposes is dependent on health hazards being overcome. Investigations using 8 miligrams per litre chlorine applied to oxidation pond effluents caused no algal kill within the first 2 hours of contact. Available chlorine attacks bacteria, causing coliform count to drop from 100,000 per 100 ml to a few tens. Enterovirus counts dropped from about 80 per 100 ml to 37 per 100 ml after chlorination. Vibro cholerai (El-Tor) were killed under these conditions, and MPN dropped from 1000 per 100 ml in the influent wastes to 2 per 100 ml in the effluents. A 5 mg per l dose of chlorine at 1 h contact time killed these sensitive bacteria, decreasing MPN to less than 2 per 100 ml. Differences between the efficiency of chlorination experiments under laboratoryand field conditions would necessitate the application of 15 mg per l chlorine for 2 h of contact. Further study is needed before unrestricted use of oxidation pond effluents for irrigation purposes is safe unless strict regulations are issued. (Bahre-Arizona)
W73-14480

WATER, SEWER, AND STORM DRAIN STUDY, UTAH COUNTY, UTAH, VOLUME I: BACKGROUND AND INVENTORY.
Despain (I. Dale) and Associates, Provo, Utah.

Prepared for Utah County Council of Governments, September 1972. 238 p, 34 maps, 97 tab.

Descriptors: *Water supply, *Sewerage, *Water demand, *Urban land use, *Storm drains, Planning, Water quality, Urbanization, Waste disposal, Governmental interrelations, Inter-Agency cooperation.
Identifiers: *Utility extension, *Utah County (Utah), Provo (Utah), Utah Valley (Utah), Four Corners Economic Development Region.

The purpose is to assess the adequacy of existing water, sewage, and storm water systems and facilities throughout Utah County and to demonstrate the most cost effective method of providing water, sewer and storm drain service to the present and future inhabitants, consistent with its adopted Land Use Plan. This area of 1,370,240 acres in north central Utah, including 92,000 acres of water surface represented by Utah Lake, lies almost entirely within Utah Lake-Jordan River drainage basin. Most agricultural and urban development and 99.7 percent of the population of 145,000 has been concentrated in Utah Valley, the territory between the base of the Wasatch Mountains on the east and Utah Lake on the west. More than 45 percent of total land area is owned or managed by a federal, state or local governmental agency. Control of nearly 38 percent of the land area is shared by the Forest Service and the Bureau of Land Management. This volume is concerned with background data on soils, population trends and projections of future urban trends in housing, commerce and industry. The major portion of this report is devoted to maps and inventories of water and sewer systems for individual communities plus an inventory of storm water facilities. (See also W73-14493) (Edwards-North Carolina)
W73-14492

WATER, SEWER AND STORM DRAIN STUDY, UTAH COUNTY, UTAH: VOLUME II, PLAN REPORT.
Despain (I. Dale) and Associates, Provo, Utah.

Prepared for Utah County Council of Governments, September 1972. 228 p, 38 fig, 71 tab, append.

Descriptors: *Planning, *Water supply, *Sewerage systems, *Storm drains, Coordination, Drainage systems, Water supply development, Canyons, Utah.
Identifiers: *Utah County (Utah), Cedar Valley (Utah), Wasatch Front Canyons (Utah), Water control.

Key elements are detailed individual plans for the 16 municipalities and other developing areas in the county, which are coordinated into one master plan. The basic goals and criteria used in formulating the plan are summarized. Evaluated are present water, sewer, and storm drain facilities, as well as a projection of future needs. Major improvement projects and programs, coupled with their priority rating, are listed. Primary responsibility for implementation rests with the individual municipalities, although the creation of an implementation organization within the Utah Council of governments is recommended in order to promote cooperative action among municipal units. A selected summary of domestic water standards and waste water standards for the state of Utah is included. (See also W73-14492) (Hoffman-North Carolina)
W73-14493

AMARILLO, TEXAS: REPORT ON SANITARY SEWERAGE AND SEWAGE TREATMENT, 1967.
Freese, Nichols and Endress, Fort Worth, Tex.

March, 1968. 59 p, 1 fig, 2 append.

Descriptors: *Sewerage, *Sewage treatment, *Sewage disposal, *Interceptor sewers, *Effluents, Design criteria, Costs, Planning, Waste treatment, *Texas.
Identifiers: Capital improvements, *Amarillo (Tex).

Focus is on three elements of the sanitary sewerage system, collection facilities, treatment plants, and the disposal and/or reuse of treated effluent. Each element is analyzed in terms of the existing situation and future requirements. Improvements are recommended for each element via detailed schedules which include projected cost estimates. Recommendations include new collection facilities for urbanizing fringe areas, the expansion of the two treatment plants, and continued use of treated effluent for industrial and agricultural purposes. The report is engineering oriented, emphasizing detailed projects up to 1972, and includes proposed improvements that are likely to be needed for 5-year intervals to 1990. A discussion of population trends and design criteria provides a basis for the analysis. (Elfers-North Carolina)
W73-14501

A NEW CONCEPT FOR OPERATOR WAGES,
Water Pollution Control Federation, Washington, D.C.
J. A. Voegtle, and F. I. Vilen.
Journal Water Pollution Control Federation, Vol 45, No 2, p 203-209, 1973. 7 tab.

Descriptors: Waste water treatment, *Compensation, *Wages, *Wisconsin, Analysis, *Cost analysis.
Identifiers: *Waste water treatment operators, Comparative wage analysis.

In order to estimate the fair compensation to a wastewater system operator a pilot study was performed with the aid of a questionnaire distributed at the Wisconsin Wastewater Operators Conference. Ten work functions were derived from data recording operator time spent in 25 different work categories for an uninterrupted six-week period. In addition, general information concerning operator credentials, experience, and responsibilities were gathered by the survey. Wage information applicable to the various work categories was gathered from the Wisconsin State Employment Service. Analysis indicates that operator wage rates are less than the total of the current rates for work in occupations corresponding to the work categories multiplied by the percentage of time spent in performing similar duties. The indication is that the operator is receiving a wage due to a man with a variety of diluted skills as represented by the work categories. One cause of this might be the application of the title 'operator' to all levels of experience and combinations of

technical skills. More specifically descriptive job titles are recommended. (Weaver-Wisconsin)
W73-14511

PRICETAG TO INDUSTRY,
Hazen and Sawyer, New York.
C. R. Walter.
Water and Wastes Engineering, Vol 10, No 1, p A13-A14, 1973.

Descriptors: *Industrial wastes, *Waste water treatment, *Use rates, Pricing, Sewage treatment, *Pollution taxes (Charges).
Identifiers: Flow charges, Surcharges, Municipal sewage systems, Waste strength.

Methods for determining fees for the treatment of industrial wastes discharged into municipal sewerage systems are discussed. Total revenues needed to support the municipal sewerage utility are calculated from all costs associated with the operation, maintenance and management of the system and treatment facilities; sewerage service charges are based on these costs which are allocated against users and properties in proportion to the benefits received. Various types of charges are levied, however the most common fee is based upon the volume of flow contributed to the system with a possible supplemental surcharge for treatment of exceptionally strong wastes. Although such surcharges are theoretically appealing they are often politically intractable as well as difficult and costly to establish. If combinations of flow charges and strength surcharges are adopted, plant expenses should be allocated to three cost-of-service components--volume costs, strength costs, and customer costs. Using this accounting scheme, the most equitable schedule of charges may be calculated. For the benefit of the local economy, industry located outside municipal boundaries should be served. Long-term contracts between cities and industries protect the city's financial stability. (Weaver-Wisconsin)
W73-14518

DES MOINES METROPOLITAN SANITARY SEWERAGE SYSTEM STUDY: PART B--MAIN SEWAGE TREATMENT PLANT.
Veenstra and Kimm, West Des Moines, Iowa.
For primary bibliographic entry see Field 06A.
W73-14529

COMPREHENSIVE WATER AND SEWER PLAN: FREDERICK COUNTY, MARYLAND, VOLUME I.
Beavin Co., Baltimore, Md.
For primary bibliographic entry see Field 06A.
W73-14530

METROPOLITAN COMPREHENSIVE WATER, SEWAGE, AND SOLID WASTE PLANNING: VOLUME I--BACKGROUND.
Bi-State Metropolitan Planning Commission, Rock Island, Ill.
For primary bibliographic entry see Field 06A.
W73-14531

METROPOLITAN COMPREHENSIVE WATER, SEWAGE, AND SOLID WASTE PLANNING STUDY: VOLUME II--INVENTORY ANALYSIS AND PLAN.
Bi-State Metropolitan Planning Commission, Rock Island, Ill.
For primary bibliographic entry see Field 06A.
W73-14532

METROPOLITAN COMPREHENSIVE WATER, SEWAGE, AND SOLID WASTE PLANNING STUDY: VOLUME III--SHORT-RANGE DEVELOPMENT PROGRAM.
Bi-State Metropolitan Planning Commission, Rock Island, Ill.
For primary bibliographic entry see Field 06A.
W73-14533

REPORT ON SANITARY SEWERS IN KANSAS CITY, KANSAS, 1973,
Kansas City Engineering Dept., Kans.
G. C. Clark.
1973. 45 P, 1 FIG.

Descriptors: *Separated sewers, *Sewerage, *Construction, Kansas, Forecasting, Sewers, City planning, Programs, Project planning, Planning.
Identifiers: *Kansas City (Kansas), *Sanitary sewers.

Expected growth in Kansas City, Kansas will require additional sewers and sewage treatment. In 1970, the City occupied an area of 58.5 acres, while at the end of 1972 it covered 109 square miles. Although a large portion of this area is currently undeveloped, the construction of an interstate highway is expected to cause rapid growth. The city is divided by a ridgline, creating a necessity for two sewer systems and two additional treatment plants; one on the Missouri River (to the south), and the other on the Kansas River. A master plan for the construction of the two plants and 40 miles of trunk sewers is presented. Forty-five projects are listed to provide sewers and sewage treatment plants. Cost is put at $27,170,440, of which federal and state grants should cover all but $6,435,143 for the 3-year program. (Poertner)
W73-14535

COMPREHENSIVE WATER AND WASTE-WATER PLAN, 1969.
Baltimore City Dept. of Public Works, Md. Bureau of Engineering.
For primary bibliographic entry see Field 06A.
W73-14538

REPORT ON REGIONAL WASTEWATER TREATMENT FACILITIES FOR THE FREDERICK METROPOLITAN AREA, FREDERICK COUNTY, MARYLAND.
Baker-Wibberley and Associates, Inc., Hagerstown, Md.
For primary bibliographic entry see Field 06A.
W73-14541

EFFECT OF WASTE WATER FROM THE ASTRAKHAN' CELLULOSE AND PASTEBOARD COMBINE ON SOIL PROPERTIES (VLIYANIYE STOCHNYKH VOD ASTRAKHANSKOGO TSELLYULOZNO-KARTONNOGO KOMBINATA NA SVOYSTVA POCHV),
V. S. Shumakov, and M. P. Popova.
Pochvovedeniye, No 10, p 99-109, October 1972. 2 fig, 12 tab, 14 ref.

Descriptors: *Water reuse, *Return flow, Furrow irrigation, *Irrigation effects, *Soil properties, Pulp and paper industry, *Pulp wastes, Domestic water, Industrial water, Irrigation water, Salinity, Salts, Leaching, Alkalinity, Permeability, Model studies.
Identifiers: USSR, Poplar trees, Solonetzization, *Astrakhan SSR.

Waste water from pulp and paper industries cannot be discharged into natural bodies of water without preliminary treatment. The use of a mixture of domestic and industrial waste water from the Astrakhan' Cellulose and Pasteboard Combine to irrigate stands of specially bred, rapidly growing poplar on Brown Desert-Steppe soils resulted in partial desalinization of saline soils in the first few years, while more rapid desalinization occurred when the same soils were irrigated with Volga water. Desalinization of variously textured Brown Desert-Steppe soils after irrigation with domestic waste water resulted in a 33% to 92% increase in total alkalinity and in the appearance of or increase in alkalinity from normal carbonates, as well as in a 5% to 16% increase in the degree of soil solonetzicity. The rate of soil solonetzization varies with soil texture and rates of irrigation-water application and absorption. Solonetzization in soil surface layers of irrigated furrows caused a sharp decrease in permeability (by a factor of 1.3 to 1.5). Occurrence of solonetzization in soils irrigated with domestic waste water was confirmed in a model experiment. To improve absorption of irrigation water by poplar, temporary furrows should be used. (Josefson-USGS)
W73-14601

EFFECTS OF TREES AND FORESTS IN NEUTRALIZING WASTE,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper.
Trees and Forests in an Urbanizing Environment, March 1971, 15 p, 3 fig, 15 tab, 48 ref. Pennsylvania Institute for Research on Land and Water Resources, Reprint Series No. 23. OWRR B-020-PA (11).

Descriptors: *Waste water disposal, *Irrigation, *Municipal wastes, *Water reuse, *Forests, Nitrogen, Phosphorus, Nitrates, Performance, Groundwater recharge, Trees, Growth rates, Industrial wastes, Water conservation.
Identifiers: *Site conditions.

The living-filter system for renovation and conservation of municipal waste water is feasible wherever you have the following site conditions: (1) Soil with an infiltration and percolation capacity sufficient to accommodate applications of waste water at recommended rates. Soil permeability must be high enough to permit drainage of the renovated effluent and to maintain aerobic soil conditions. In this respect, forests are particularly suitable, since most forest soils are very porous and have higher infiltration and percolation rates than tilled agricultural land. In addition, most forest soils remain porous during the winter season. (2) Soil with sufficient chemical-adsorptive capacity, water-retentive capacity, and depth to the groundwater table to temporarily retain dissolved minerals for use by the vegetative cover and microorganisms and thus prevent groundwater contamination. (3) Low relief with a vegetative cover and a protective accumulation of surface organic matter to prevent and minimize surface runoff, particularly during the winter months. (4) A groundwater aquifer with a fairly deep water table to accommodate subsequent changes in groundwater storage, and with sufficient horizontal permeability to allow for adequate lateral displacement of the renovated waste water. (Galwardi-Texas)
W73-14610

SPRAY IRRIGATION OF SEWAGE EFFLUENT AND SLUDGE,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper.
In: Proceedings, First National Conference on Composting-Waste Recycling, Rodale Press, Emmavs, Pennsylvania, September 1971, p 65-78, 17 tab, 13 ref. Pennsylvania Institute for Research on Land and Water Resources Reprint Series No 27. OWRR B-020-PA (12).

Descriptors: *Waste water disposal, *Irrigation, *Municipal wastes, *Water reuse, *Forests, Nitrogen, Phosphorus, Nitrates, Performance, Groundwater recharge, Trees, Grasses, Legumes, Growth rate, Water conservation, Revegetation.
Identifiers: Acid mine spoil banks, *Spray irrigation.

Eight years of research have indicated that the living filter system for renovation and conservation of municipal waste water is feasible and that com-

binations of agronomic and forested areas provide the greatest flexibility in operation. Such a system is more adaptable to small cities and suburbs than to large metropolitan areas because of the availability of open land close to the waste water treatment plant, although the land area requirement is not a major prohibitive factor. At the recommended level of irrigation, 2 inches per week, only 129 acres of land would be required to dispose of 1 million gallons of waste water per day. Although large contiguous blocks of agricultural and natural forest land would be the most desirable for efficiency and economy, major metropolitan areas could utilize golf courses, playing fields, forest preserves and parks, greenbelts, scenic parkways, and perhaps even divided highway and beltway medial strips. Preliminary results after two years of research also indicate that municipal waste waters might also be used to reclaim and revegetate many of the barren bituminous strip-mined spoil banks existing throughout the Appalachian region and restore them to a more esthetic and productive state. (Galwardi-Texas)
W73-14612

A SYSTEMS APPROACH TO SOLID WASTE MANAGEMENT IN ASIA: BANGKOK, THAILAND, AS A CASE STUDY,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
R. J. Frankel, and E. A. R. Ouano.
In: Systems Approaches to Developing Countries, Proceedings of Symposium, sponsored by International Federation of Automatic Control and the International Federation of Operational Research Societies, Algiers, Algeria, May 28-31, 1973, p 247-253, 1973. 5 fig, 1 tab, 3 ref.

Descriptors: *Solid wastes, *Management, *Evaluation, *Systems analysis, Simulation analysis, Linear programming, Optimization, Waste disposal, Waste treatment, Economics, Mathematical models.
Identifiers: *Thailand (Bangkok), Asia, Waste collection, Cost sensitivity.

A study which presents a systems approach for handling solid waste porblems in the Asian environment, using Bangkok as a case study is reported. The systems approach accounts for the interdisciplinary nature of solid waste management and permits for systematically dividing the problem into specialized sub-problems which can be handled by more comprehensive techniques. In this study, variables and parameters that affect the effectiveness of solid wastes collection, treatment and disposal in Bangkok were analyzed. A field study was conducted to measure the values of the collection system, to quantify the stochastic nature of the parameters, and to determine the efficiency of present crew utilization. A computer simulation model was developed to quantify the interactions of variables in the collection system. The model was verified using current operation data. A sensitivity analysis using variations in crew size, truck volume, type of container and alternative means of disposal was performed using the simulation model. Linear programming techniques were employed to determine the least cost alternative or optimum combination of alternatives regarding choice of site for facilities for treatment and disposal. Recommendations for improving the present system were made given the social and economic constraints existing in Bangkok. Comparison of the solid waste management practices in Bangkok, Manila, and Hong Kong was made to extend the usefulness of the developed methodology to other Asian cities. (Bell-Cornell)
W73-14674

ZERO DISCHARGE - THE ULTIMATE IN WATER CONSERVATION,
Battelle Inst., Geneva (Switzerland). Chemical and Environmental Engineering Systems Div.
J. C. Shorrock, and M. G. Royston.
British Water Supply No. 3, p 12-16, March 1973. 1 fig.

Descriptors: *Recycling, *Waste water treatment, Water treatment, Fermentation, *Water reuse, *Water conservation.
Identifiers: *Zero discharge, Residuals management.

Zero discharge refers to a goal for water-use systems in which all wastes are resources which can be used. It is based on a concept of finite resources. It is recommended that all bodies using water should develop a conceptual zero-discharge strategy and use this as a long-range planning tool for fixing realistic targets, planning future systems, and for the allocation of priorities to research and development objectives. The alternative approach is seen as playing a passive role, waiting to be forced into taking action by authorities. Steps in establishing a zero-discharge strategy are (1) inventorying water consumption item by item and listing positive means to be adopted to limit consumption to minimum levels required by each process stage, (2) defining qualities of water required, and (3) establishing treatment levels for recycle of water. Systems for upgrading dissolved pollutants are fermentation, evaporation and distillation, reverse osmosis, chemical precipitation, filtration and decantation, and electrochemical processes. (Stein-North Carolina)
W73-14684

ENVIRONMENTAL PROTECTION: NEW NAVY DUTY,
A. J. Ogrinz, III.
Environmental Science and Technology, Vol 7, No 1, p 26-29, January 1973. 2 fig.

Descriptors: *Ships, *Harbors, *Sewage treatment, *Oil spills, Radioactivity, Water pollution control, Submarines, *Pollution abatement, Waste disposal.
Identifiers: Shipboard wastes, Holding tanks, Recirculating flush systems.

Importance of environmental planning has been officially recognized by the U.S. Navy by creation of an Environmental Protection Division, awards for outstanding performance in protection of the environment and initiation of a series of studies in pollution control research. An electro-mechanical incinerator system to treat shipboard sewage has been developed by Fairbanks-Morse Research Center, Pittsburgh. Also holding systems and recirculating flush systems have been studied with holding tanks favored by preliminary evaluation. A prototype sewage disposal system on submarine tender Fulton has 3 parts: (1) on-board sewage teatment plant collects and incinerates the Fulton's sewage, (2) all other wastes are collected by internal manifold and transferred ashore, (3) a third system transfers sewage from submarines which come alongside for repair. Lack of radioactivity above normal background levels in harbors where naval nuclear-powered ships are based indicates no additional plans or procedures necessary. A mandatory design change which reroutes storage tank overflow lines in ships to a series of tanks equipped with an overflow alarm may reduce the number of oil spills per refueling. Long range goals envision all wastes--sewage, oil, solids, etc. disposed of ashore when in port thus halting discharges of oil into ocean water. Navy's environmental program funding has been virtually without opposition. Benefits of an effective environmental program are: (1) cleaner environment, (2) improved international image for U. S., (3) better cooperation with private industry for cleaner harbors. (Stein-North Carolina)
W73-14689

WASTE TREATMENT SYSTEM,
J. D. Brown.
U. S. Patent No. 3,749,243, 4 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 912, No 5, p 1807, July 31, 1973.

Descriptors: *Patents, *Waste water treatment, Equipment, *Aeration, Pollution abatement, Water quality control, Water pollution control.

Dual clarifiers selectively receive an inflow of effluent, through the operation of a switch gate, from a pressure tank where the effluent is mixed with air and certain chemicals. The clarifiers incorporate upper and lower skimming and sludge removal raking apparatus. The rakes remove the solids to discharge flow lines entering a central sludge reservoir. The remaining liquid moves through flow lines into a vertical aerator tank where it is subjected to pressure aeration. The air is dispersed through the liquid effluent and partially dissolved with the subsequent passage of the effluent to one of the clarifiers. The system is to incorporate automatic controls which include a limit switch mounted on the lip of the skimmer trough associated with each clarifier. The switches sense the attainment of a specific effluent level and are automatically activated to divert inflowing effluent to the proper clarifier. Flow from clarifier to aerator is also automatically regulated. (Sinha-OEIS)
W73-14691

SACRIFICIAL ELECTRODE SYSTEM FOR REMOVAL OF HEAVY METAL IONS FROM WASTE WATER,
Nalco Chemical Co., Chicago, Ill. (assignee)
E. E. Johnson, R. N. Buggs, and R. L. Kornmann.
U. S. Patent No. 3,748,240, 2 p, 4 ref; Official Gazette of the United States Patent Office, Vol 912, No 4, p 1523, July 24, 1973.

Descriptors: *Patents, *Waste water treatment, Metals, Electrodes, Cathodes, *Electrolysis, *Ions, *Heavy metals, Pollution abatement, Water pollution control, Water quality control, *Mercury (Metal), Silver, Lead, Cadmium, Copper.
Identifiers: Acid, Insoluble sulfides.

A method and an electrode cell system are discussed for the removal of certain heavy metal ions in solution especially from waste water. The process consists of precipitating the ions at a pH below 7 as an acid insoluble sulfide. The ions are electrolized in a carbon/carbon electrode cell system. The sacrificial cathode contains 20-80% cathode weight of elemental sulfur. Six examples are presented. The system is particularly applicable to the removal of mercury ions to form mercury sulfide and mercury bisulfide. It is also applicable to heavy metals ions such as silver, lead, cadmium, and copper. These can form acid insoluble sulfides which then can be centrifuged or filtered and removed from the system. (Sinha-OEIS)
W73-14693

BATCH SEWAGE TREATMENT SYSTEM AND METHOD,
BioPure, Inc., Tualatin, Oreg. (assignee)
L. R. Gensman, and J. R. Nunn.
U. S. Patent No. 3,746,638, 6 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 912, No 3, p 1057, July 17, 1973.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Equipment, *Aerobic treatment, Pollution abatement, Water quality control, Water pollution control, Aeration.

Incoming sewage is mixed and aerated continuously (or intermittently under low flow conditions) and withdrawn in batches for clarification and discharge. A basket having open mesh side and bottom walls is partly submerged in the mixed aerated sewage. A portion of the aerated mixed liquor is circulated through the basket to cause aerobic digestion and hydraulic erosion. Batches

of mixed liquor are intermittently pumped into a settling chamber in excess of the amount filling the settling chamber. The excess is discharged back into the aeration chamber over a weir and acts to skim floating sludge back into the aeration chamber. The resulting batch thus withdrawn from the aeration chamber is settled in the settling chamber under quiescent conditions. A part of the settled batch, specifically supernatant liquor taken from below the top scum layer, is then delivered to a discharge chamber. It is further settled and the resulting supernatant liquor discharged. Settled sludge and floating scum from the settling and discharge chambers are returned to the aeration chamber by pumps which completely empty these chambers. (Sinha-OEIS)
W73-14694

SIMPLE WATER TREATING APPARATUS,
Kurita Water Industries Ltd., Osaka (Japan). (assignee)
For primary bibliographic entry see Field 05F.
W73-14695

SELECTIVE MULTI-STAGE FILTRATION SYSTEM,
R. Nebolsine, and G. San Roman.
U. S. Patent No. 3,746,172, 3 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 912, No 3, p 944, July 17, 1973.

Descriptors: *Patents, *Waste water treatment, *Filtration, *Oil wastes, Oily water, *Oil pollution, Equipment, Pollution abatement, Water pollution control, Water quality control.

This filtration system consists of inter-connected filter units, each being adapted to use one or more filter media and operated at its own rate and also having its own back-wash cycle. In the treatment oily waste water or other fluid enters an initial unit referred to as an oil separator. An interceptor is connected to an oil outflow pipe for removal of oil for storage. The interceptor also has a discharge pipe at its base for passage of sludge to discharge tank. (Sinha-OEIS)
W73-14696

SLUDGE SEPARATION SYSTEMS EMPLOYING REFRIGERATION MEANS,
Carrier Corp., Syracuse, N.Y. (assignee)
F. B. Neyhart, and J. S. Styron.
U. S. Patent No. 3,745,782, 5 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 912, No 3, p 847, July 17, 1973.

Descriptors: *Waste water treatment, *Patents, *Water treatment, Potable water, Water quality control, Freezing, Condensation, *Heat exchangers, *Refrigeration, *Sludge treatment, Separation techniques.
Identifiers: Alum.

An apparatus for promoting separation of the solid and liquid constituents of a sludge is provided with a pair of identical falling film heat exchangers which alternately serve as a refrigerant evaporator and refrigerant condenser. The refrigeration system is provided to freeze sludge in one heat exchanger by evaporating the refrigerant on the exterior of the heat exchange tubes. The evaporated refrigerant is compressed and condensed on the exterior of the tubes in the other heat exchanger. Recirculation for sludge is provided to continuously cool and solidify a thin film of the sludge descending in the heat exchange tube of one heat exchanger and a similar recirculation is provided for recirculating cooling medium. The refrigeration system is systematically reversed, using the cooling capacity of the frozen sludge in the heat exchange tubes of one of the heat exchangers to condense refrigerant while freezing sludge. (Sinha-OEIS)
W73-14697

MARINE SEWAGE COLLECTION AND DISCHARGE SYSTEMS,
K. F. Kennedy.
U.S. Patent No 3,703,960, 4 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 904, No 4, p 518, November 18, 1972.

Descriptors: *Waste water treatment, *Patents, *Sewage treatment, Treatment facilities, Boats, *Domestic wastes, *Sewage disposal, Pollution abatement, Water pollution control, Water quality control.
Identifiers: Waterfront facilities.

Sewage at waterfront facilities where houseboats, boats and ships are moored and/or stop for service is collected in a system supported by the facilities such as docks and floats and then pumped into a shore system. The system is designed to be responsive to water motions caused by watercraft, wind, waves, and tides. The partially submerged collection tanks are often comprised of multiple sections of sewer pipes sealed together and then capped at the remaining open ends. Sewage from the waterfront facilities is directed through flexible couplings and collection pipes, arranged on grade, into partially submerged holding tanks. Each tank is equipped with pumping apparatus to periodically discharge sewage into pipes leading to a sewage system ashore. (Sinha-OEIS)
W73-14701

IMPROVED CROSS-FLOW FILTRATION PROCESS FOR REMOVAL OF TOTAL ORGANIC CARBON AND PHOSPHATES FROM AQUEOUS SEWAGE EFFLUENTS,
K. A. Kraus, and H. A. Mahlman.
U. S. Patent Application Serial No 200,840 (70), November 22, 1971. 14 p, 3 fig, 5 tab.

Descriptors: *Patents, *Waste water treatment, *Filtration, Water pollution control, *Sewage treatment, *Organic compounds, *Phosphates, Pollution abatement, Water pollution control.

A cross-flow filtration process is described for the removal of total organic and phosphate content of aqueous sewage effluents. An additive selected from powered carbon, a salt of hydrous metal oxide, or the hydrous oxide is included in an aqueous feed sewage in small but effective amounts. The mixture is pumped through a filter unit of the internal or external flow-through type at a pressure and velocity sufficient to effect cross-flow filtration. Typical presures used experimentally were in the range 3 to 100 psi and cross-flow velocity in the range 2 to 30 ft/sec. Several modes of cross-flow filtration are set forth. The filtering medium comprises a porous substrate material having pores of from 5 to as much as 200 microns in size aided by an inert filter aid material deposited on the feed side of the substrate material. The substrate material may comprise flexible, pressure-resistant fire hose jacket for example, made from polyester warp with nylon filler; stainless steel or other metal screening; nylon, polyester or other synthetic screens; and porous ceramic or carbon. The filter aid may be selected from such material as diatomaceous earth, perlite, asbestos fiber, cellulose fiber, silica gel, and carbon fiber or powder. Six examples and test results are given. (Sinha-OEIS)
W73-14702

EVALUATION OF TREATMENT FOR URBAN WASTEWATER REUSE,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
K. D. Linstedt, and E. R. Bennett.
Available from GPO, Washington, DC 20402 as EP1.23/2:73-122 - Price $2.10; microfiche from NTIS as PB-723 726 $1.45. Environmental Protection Agency, Environmental Protection Technology Series, Report EPA-R2-73-122, July 1973. 139 p, 73 fig, 8 tab, 51 ref. EPA Project 17080 DOI.

Descriptors: *Sewage treatment, *Waste water treatment, *Water reuse, Model studies, Methodology, Water conservation, Water pollution control, Water utilization, Recirculated water, Industrial water, Reclaimed water, Treatment facilities.

The efficacy of combining biological nitrification with each of two modes of chemical clarification is evaluated for production of a water suitable for specific industrial reuse applications. A 7200 gpd pilot plant was constructed, operated and analyzed. In the conventional clarification system, low doses of lime or alum were effective in removing greater than 95% of the BOD, turbidity, and suspended solids from the nitrified secondary effluent. Efficient phosphorus removals necessitated higher lime and alum additions of 300 mg/liter, and 100-150 mg/liter, respectively. At the higher lime doses, a two-fold reduction in bacterial organisms was achieved. Specific heavy metals were removed through both alum and lime additions. With either coagulant chemical, practical rapid sand filter runs of 16 hours were possible. Similar removal results were obtained with alum in a high-rate clarification flow system with direct dual-media filtration of alum flocculated wastewater. Filter runs of 5-6 hours could be realized. (Woodard-USGS)
W73-14750

5E. Ultimate Disposal of Wastes

SLUDGE PROCESSING FOR COMBINED PHYSICAL-CHEMICAL-BIOLOGICAL SLUDGES,
Brown and Caldwell, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05D.
W73-14218

ULTIMATE MANAGEMENT OF RADIOACTIVE LIQUID WASTES,
Idaho Nuclear Corp., Idaho Falls.
For primary bibliographic entry see Field 05G.
W73-14390

SEWAGE EFFLUENT AND SLUDGE MAKE POSSIBLE REVEGETATION OF STRIP MINE SPOIL BANKS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
W. E. Sopper, and L. T. Kardos.
Science in Agriculture, Vol 18, No 3, p 10-11, Spring 1972, 1 fig, (Pennsylvania Institute for Research on Land and Water Resources Miscellaneous Technical Report, 1971). OWRR B-020-PA (9).

Descriptors: *Sewage effluents, *Sewage disposal, *Sludge disposal, *Water reuse, Irrigation, *Strip mine wastes, Revegetation, Trees, Grasses, Legumes, Hydrogen ion concentration, Temperatures, Soil moisture, Pennsylvania, Nitrogen, Phosphorus, Toxicity, Salts.
Identifiers: Strip mine spoil banks, Toxic chemicals.

Irrigation of coal strip-mine spoil material with municipal sewage effluent and liquid digested sludge has produced dramatic results in survival and growth of tree seedlings and growth of grass and legume cover. Results indicate that these harsh sites devoid of vegetation for decades can be improved and revegetated by irrigation with wastes from municipal sewage effluent plants. Since treated sewage effluent had produced significant crop yields and tree growth, the decision was made to try the same technique on reclaiming barren waste land. Effects of the irrigation treatments on certain chemical attributes of the soil solution in the spoil were examined by sampling the percolate which passed through the 3.5 foot depth of spoil, using lysimeters installed in the

sand layer below the spoil. Potential toxicity of a spoil is best characterized by the pH. Average pH of the percolate obtained from natural rain during the months prior to the irrigation treatment ranged between 2.2 and 2.8, indicating severely toxic acidic conditions. Over the 24-week irrigation period the average pH was relatively unchanged except for the treatment using 2 inches each of effluent and sludge per week, where the pH increased significantly to 4.06. This is also the treatment which had the greatest dry matter production of grasses and legumes and the best height growth of tree seedlings. (Gelwardi-Texas)
W73-14611

REVEGETATION OF STRIP MINE SPOIL BANKS WITH SEWAGE EFFLUENT AND SLUDGE,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
W. E. Sopper, and L. T. Kardos.
Clover Leaves, Vol 12, p 14-16, May 1971. OWRR B-020-PA (13),

Descriptors: *Sewage effluents, *Sewage disposal, *Sludge disposal, *Irrigation, Strip mine wastes, Revegetation, Trees, Grasses, Legumes, Hydrogen ion concentration, Temperature, Soil moisture, Pennsylvania, Nitrogen, Phosphorus, Toxicity, Salts.
Identifiers: Strip mine spoil banks, Toxic chemicals.

Spoil material was obtained from a bank over the Lower Kittanning bituminous coal seam in Clearfield County, Pennsylvania. This bank was selected because it has remained barren for 23 years despite repeated attempts at revegetation and is extremely acid (pH 2.0 to 3.0). Ten boxes were filled with 3 1/2 feet of spoil material in the fall of 1968, allowed to consolidate over the winter and refilled to capacity in the spring of 1969. In April 1969 each box was planted with seven species of tree seedlings--Japanese larch, white spruce, Norway spruce, white pine, European alder, hybrid poplar, and black locust. In addition, 2 species of grass (orchard grass and tall fescue) and 2 species of legumes (crown vetch and birdsfoot trefoil) were broadcast seeded in each box. Two of the boxes were untreated and maintained as controls. The remaining eight boxes were divided into four groups of two boxes for varying degrees of treatment. Treatments were very effective in establishing a ground cover of grasses and legumes. Growth response of each species was measured in terms of pounds of dry matter produced per acre and percentage of ground cover. Best germination and growth was obtained with the treatment, 2 inches of effluent and 2 inches of sludge per week, (2E+2S). Orchard grass and tall fescue had the highest dry matter yields of 3237 and 2646 pounds per acre, respectively. It was quite apparent from the results that sludge was a necessary prerequisite to the establishment of grasses and legumes from seed. The organic residue in the sludge provides the necessary additional detoxifying action to permit the germinated grasses and legumes to survive and grow. The percentage cover of the spoil material by the grasses and legumes on the irrigated treatments ranged from 28 to 100% for orchard grass, 5 to 91% for tall fescue, 3 to 56% for birdsfoot trefoil, and 2 to 58% for crown vetch. (Galwardi-Texas)
W73-14613

5F. Water Treatment and Quality Alteration

SLUDGE CONDITIONING USING SO2 AND LOW PRESSURE FOR PRODUCTION OF ORGANIC FEED CONCENTRATE,
Snell (Foster D.), Inc., Florham Park, N.J.
For primary bibliographic entry see Field 05D.
W73-14222

CITY OF ESCONDIDO AND VISTA IRRIGATION DISTRICT FEASIBILITY STUDY OF JOINT FILTRATION PROGRAM.
Montgomery (James M.), Inc., La Jolla, Calif.

December, 1971. 25 p, 3 fig, 2 plates, 21 tab, 1 append.

Descriptors: *Water supply, *Water treatment, *Filtration, Costs, Joint costs, Water requirements, *California.
Identifiers: Joint treatment plant, Escondido (Calif), Vista Irrigation District (Calif), Lake Henshaw (Calif).

The northern part of San Diego County has experienced a rapid increase in population during the past decade coupled with a significant trend away from agricultural use of land toward use for housing and commercial purposes. As this trend continues public demand for water of a higher quality increases. Water for both the Vista Irrigation District and the City of Escondido is obtained from the Colorado River and Lake Henshaw. Except for clorination and some addition of alum to reduce turbidity, neither of these two sources are now provided with treatment of any sort. The basic finding of this study is that it would be economically desirable for the City of Escondido and the Vista Irrigation District to construct a joint water treatment plant designed to meet initial needs through 1990, to be enlarged as future requirements dictate. Several alternative plans for the size and operation of such a plant are analyzed, particularly in terms of costs. The recommended plant size of 50 mgd would significantly reduce operation and maintenance costs as compared to two individual plants. Detailed cost data, analyses of water requirements for Escondido and the Vista Irrigation District, a discussion of the water treatment process, plus a site plan and map of the proposed plan are included. (Elfers-North Carolina)
W73-14240

REVERSE OSMOSIS FOR WASH WATER RECOVERY,
Envirogenics Systems Co., El Monte, Calif.
For primary bibliographic entry see Field 05D.
W73-14387

INFLUENCE OF SURFACE OXIDES ON ADSORPTION AND CATALYSIS WITH ACTIVATED CARBON,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-14394

KINETICS OF VIRAL INACTIVATION BY BROMINE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. G. Taylor, and J. D. Johnson.
Available from ASC-Div of Water, Air and Waste Chem., Publications Manager, Mellon Inst., 4400 Fifth Ave., Pittsburgh, Penn. 15213, Price $4.00. In: Preprints of Papers Presented at 165th National Meeting of American Chemical Society, April 8-13, 1973, Dallas, Tex: American Chemical Society, Division of Water, Air and Waste Chemistry, Vol 13, No 1, Paper 61, p 56-61, 1973. 4 fig, 11 ref.

Descriptors: *Bromine, *Bromides, *Disinfection, *Viruses, Treatment, *Water treatment, Swimming pools, *Waste water treatment.

Bromine was studied as an alternative to chlorine in the disinfection of water and wastewater. Although combined chemical species are produced when water containing organic amines or ammonia are treated with either chlorine or bromine, chloramines are ineffective as disinfectants for cysts, bacteria and viruses. Any nitrogen compounds in chlorinated waters, therefore, produce a net loss of the free chlorine species necessary for disinfection. Bromine, on the other hand, is available for the disinfection of bacteria and viruses whether it exists as free, mono or dibromamize. In addition, bromine has other characteristics which make it desirable as a disinfectant for swimming pool waters. Even high concentrations of bromine lack the problems of eye irritation and odor commonly found in chlorinated swimming pools. Bromine chloride is available as a gas at low pressure rather than as a liquid, and therefore promises to be easier to dose than liquid bromine. Moreover, since HOBr is only ionized 6% at pH 7.5 (versus 50% HOCL) only about one-half the amount is required to achieve the same concentration of active halogen at pH 7.5. (Knapp-USGS)
W73-14395

A RATIONALE FOR THE REGIONALIZATION OF PUBLIC WATER SYSTEMS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 06B.
W73-14515

WELLESLEY -- A CASE STUDY OF THE WATER RESOURCE PROBLEMS OF A GROWING SUBURBAN MUNICIPALITY,
Boston Univ., Mass. Dept. of Hydrogeology.
For primary bibliographic entry see Field 06A.
W73-14534

SIMPLE WATER TREATING APPARATUS,
Kurita Water Industries Ltd., Osaka (Japan). (assignee)
K. Watanabe.
U. S. Patent No. 3,746,174, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 912, No 3, p 945, July 17, 1973.

Descriptors: *Patents, *Water treatment, Equipment, Chlorine, *Activated carbon, Organic compounds, Water quality control, Waste water treatment, Potable water.
Identifiers: *Chemical conditioners, *Chemical treatment, Ferric compounds.

In the apparatus water is conditioned chemically by conditioning materials enclosed in a magazine. Conditioning materials such as active carbon which adsorbs organic and ferric components in the water, and calcium sulfite pellets which eliminate residual chlorine are enclosed in the magazine of the treatment unit. Only the water treated inside the magazine is discharged at the outlet. This is accomplished by using the water pressure at the tap to prevent the flow of untreated water by-passing the magazine. The higher the water pressure the greater this effect. The magazine consists of cylindrical body walls, a magazine cap and a magazine bottom. The cap and bottom each have water passages in the form of holes or slots. A screen of small mesh is applied on the inner surface of the magazine cap and bottom to prevent the enclosed water conditioning material from being carried out through the water passage. (Sinha-OEIS)
W73-14695

SLUDGE SEPARATION SYSTEMS EMPLOYING REFRIGERATION MEANS,
Carrier Corp., Syracuse, N.Y. (assignee)
For primary bibliographic entry see Field 05D.
W73-14697

EXPERIMENTAL DATA FOR SUBSTANTIATING THE RESIDUAL CONCENTRATIONS OF CHLORINE DIOXIDE IN DRINKING WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 05C.

W73-14707

A POTABLE WATER DISPENSER, (PATENT APPLICATION, NASA CASE MFS-21115-1),
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center. (Assignee).
H. R. Cunningham.
Available from the National Technical Information Service as N72-28097. U.S. Patent Application Serial No. 266,930, June 28, 1972. 20 p, 7 fig.

Descriptors: *Patents, *Potable water, Equipment, Water utilization, Water measurement, *Jets.
Identifiers: *Water dispensers.

A dispenser supplies precisely measured charges of potable water into food or beverage reconstitution bags used aboard spacecraft. It has a water dispensing jet at one end and a measuring stop at its opposite end. The dispenser includes a tubular body having an axially 'reciprocable' piston within it. The piston is spring-biased toward an end wall forming a closure and having a chamber intake port and a chamber ejection port. The volume of the chamber is dictated by the position assumed by the head of the piston. The extent to which the piston is displaced for expanding the chamber is dictated by the position assumed by the measuring stop. Delivery of potable water to and from the chamber is controlled by a rotary valve while final dispensing of water is controlled by a juxtaposed linear valve. (Sinha-OEIS)
W73-14734

A FLUID DISPENSER, (PATENT APPLICATION, NASA-CASE-MFS-21163-1),
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center. (Assignee).
T. A. Cook, and H. Scheibe.
Available from the National Technical Information Service as N72-28098. U.S. Patent Application Serial No 266,925, June 28, 1972. 18 p, 8 fig.

Descriptors: *Patents, Water supply, Equipment, Water utilization, *Potable water, Water measurement, *Jets.
Identifiers: *Water dispensers.

A fluid dispenser is described for use in dispensing precisely measured quantities of potable water aboard operative spacecraft. It is confined within a housing designed to be held in a crewman's hand and is coupled with a source of potable water under pressure. The dispenser is provided with a jet which has a mouthpiece for use of the crewman. An innovation is that it has a manually operable rack and pinion drive coupling for initiating a dispensing cycle so that an accurate record of water consumed can be maintained. Mounted on the housing is the trigger unit having a thumb-actuated lever which is digitized for initiating the operation of the dispenser. The housing contains a network of fluid conducting passageways including an inlet passageway which terminates at an intake port. There is a dispensing passageway which terminates at the mouth piece of the jet. The measuring chamber is, in practice, a bore having a cylindrical configuration terminating in a base wall. The dimensions of the measuring chamber at any given instant are determined by the position then assumed by a plug relative to the longitudinal axis of the chamber. The chamber is permitted to discharge only after it has been completely filled and the thumb-actuated lever is released. This permits the crewman to properly position his lips over the mouthpiece before releasing the lever so no water will be spilled. (Sinha-OEIS)
W73-14735

5G. Water Quality Control

A SELECTED ANNOTATED BIBLIOGRAPHY ON WATER RESOURCES OF THE STATE OF WASHINGTON.
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 02E.
W73-14201

A SELECTED ANNOTATED BIBLIOGRAPHY ON COLUMBIA AND SNAKE RIVERS.
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 02E.
W73-14202

PRIVATE SECTOR REACTION TO NORMAL POLITICAL INSTITUTIONAL PROCEDURES AND OUTCOMES WHEN WATER IS AN ISSUE,
Clemson Univ., S.C. Dept. of Political Science.
For primary bibliographic entry see Field 06E.
W73-14210

INSTREAM AERATION TO CONTROL DISSOLVED SULFIDES IN SANITARY SEWERS,
Jefferson Parish Dept. of Sanitation, Metairie, La.
For primary bibliographic entry see Field 05D.
W73-14220

AN ASSESSMENT OF AUTOMATIC SEWER FLOW SAMPLERS,
Hydrospace-Challenger, Inc., Rockville, Md.
For primary bibliographic entry see Field 05A.
W73-14221

POLLUTION FROM ANIMAL FEEDLOTS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-14227

LANCASTER COUNTY, PENNSYLVANIA, COMPREHENSIVE SEWERAGE PLAN.
Huth Engineers, Inc., Lancaster, Pa.

Prepared for Lancaster County Planning Commission, October, 1970. 103 p, 8 fig, 26 tab, 9 append.

Descriptors: *Sewerage, *Comprehensive planning, *Pennsylvania, Regional development, Planning, Coordination, Sewage treatment, Sewage disposal, Financing, Land use, Treatment facilities.
Identifiers: *Lancaster County (Pa.), Pennsylvania Sewage Facilities Act, Sewage Facilities Committee.

Using horizon years of 1980, 1990, and 2010, this study calls for eventual formation of six regional sewerage systems and six municipal systems to serve 85% of the county's population by 2010. The remainder of the county would be served by 'package' treatment plants and on-site disposal systems. Multiple sewerage systems are to be based on drainage basins because population density will be insufficient to warrant a unitary sewerage system. Lancaster County commissioned the study in response to the Pennsylvania Sewage Facilities Act (Act 537). Considerations in the sewerage system planning process included population projections, local economic conditions, existing public facilities, natural resources (especially soil types), agricultural land-use patterns, topography, methods of administering, financing and operating regional sewerage systems, and currently proposed sewerage plans. The study recommends a regional approach to sewage collection and treatment with establishment of a Sewerage Facilities Committee to coordinate specific projects. The basis for this recommendation is a brief exposition of alternative administrative and financial techniques for sewerage systems. Extensive technical data including 13 plates are in the appendices. (Stein-North Carolina)
W73-14234

REPORT ON MAKEUP WATER FOR THE UPPER CANYON LAKES, LUBBOCK, TEXAS.
Freese, Nichols and Endress, Fort Worth, Tex.

September, 1971. 38 p, 7 fig, 9 tab, 3 append.

Descriptors: *Water quality, *Water quality control, *Reclaimed water, Water treatment, Groundwater, Irrigation, Effluents, Evaluation, *Texas
Identifiers: *Spray irrigation, *Lubbock (Tex).

Lubbock proposes a chain of small lakes for recreational non-swimming use in a dry canyon running through the city. The study identifies three alternative sources of makeup water, each of which would have to be pumped upstream approximately eight miles into the uppermost lake. Alternative sources are (1) groundwater from beneath farmlands now being irrigated with treated effluent from the city's Southeast Reclamation Plant, (2) effluent from the new activated sludge unit at the Southeast Plant without intermediate use of the water for irrigation, and (3) water reclaimed by an operational-scale plant similar to a present pilot plant of Ecological Research Associates. Quantitative standards for water quality which would protect environmental health and aesthetics were set. Quality of water from the three sources was compared with the desired standards. Groundwater from beneath the irrigated farm needed only to be aerated to replenish dissolved oxygen, while other sources would require significant additional treatment in order to meet the standards. Costs of treating water from each source to raise water quality to the desired standards were calculated. It was concluded that the groundwater source would be superior to alternatives in terms of both water quality and economy. (Stein-North Carolina)
W73-14236

WATER QUALITY MANGEMENT PLAN FOR ALAMEDA CREEK WATERSHED ABOVE NILES.
Brown and Caldwell, San Francisco, Calif.

September, 1972. 205 p, 66 fig, 58 tab, photos, 2 append.

Descriptors: *Planning, *Water quality, Financing, Water demand, Water supply, Wastewater disposal, Environmental effects, California.
Identifiers: *Government standards, Alameda County (Calif.), Livermore (Calif.), Pleasanton (Calif.).

A comprehensive water supply and waste water treatment and disposal plan via a total water quality management approach is discussed. The study divides into three major sections: First, existing environmental characteristics and water supply and wastewater programs are reviewed. Second, water quality problems and objectives are identified. The methodology for cost estimates and economic analyses is explicated. Third, the conceptual development and engineering and economic evaluation of alternative plans is described, together with an evaluation of the effects of each on downstream areas and benefits of improvements to the Alameda Creek watershed area, located southeast of San Francisco, California. The final recommended plan is described in terms of physical facilities, costs, staging and governmental structures and institutional frameworks required for implementation. Specifically, a staged wastewater reclamation plan emphasizing land disposal and implemented by a single Valley-wide agency is recommended. (Hoffman-North Carolina)
W73-14237

AREAWIDE COMPREHENSIVE WATER-SEWER PLAN, PART 2, PHASE I, 1970-1995, BREVARD COUNTY, FLORIDA.
Brevard Engineering Co., Cape Canaveral, Fla.

Prepared for Brevard County Board of County Commissioners, and Brevard County Planning Department, September, 1972. 104 p, 20 fig, 25 tab.

Descriptors: *Planning, *Water supply, *Sewerage, *Coordination, Storm drains, Urban areas, Land use, Costs, Water quality standards, Projections, *Florida.
Identifiers: *Cape Kennedy Space Center, Brevard County (Fla).

The rapid rate of growth and existing levels of urban development in Brevard County, largely because of the Cape Kennedy Space Center, make it necessary for county coordination and planning in the extension of water sewerage, and drainage facilities. The county is presently serving as a liaison between local governmental units. Discussed are factors affecting utility extension such as population trends, urban land use patterns, urban development policies, and pollution standards; alternative plans and systems; recommended treatment processes and utility systems; implementation, including a short range program; and preliminary cost estimates for the main system components. Basic recommendations include the interconnection of the three main local water supply systems and the disposal (and eventual reuse) of effluents west of the coastal ridge to conserve water supplies. (Elfers-North Carolina)
W73-14241

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME V. CAPITAL IMPROVEMENTS PROGRAM,
Diversified Consultants, Inc., Jackson, Miss.
J. A. Elliott, R. L. Waters, and A. P. Desmarais.
Available from the National Technical Information Service as PB-213 096; $5.75 in paper copy, $1.45 in microfiche. Prepared for the Gulf Regional Planning Commission, Gulfport, Mississippi, 1972. 67 p, 1 fig, 2 tab, 62 ref. MS-USE-1.

Descriptors: *Planning, *Water supply, *Sewerage, *Storm drains, *Mississippi Gulf Coast, Coasts, Implementation, Financing, Priorities, Costs.
Identifiers: *Capital improvements, *Mississippi Gulf Region, Utilities extension, Council of Governments.

Key objective of this engineering-oriented program for the planning and development of water supply, sanitary sewerage, storm drainage, and solid waste disposal systems for a four county region in Mississippi is to provide capital improvements which will encourage and support new growth and development. Focus is on implementation of areawide urban systems problems. Three basic alternative approaches appear practical: (1) establishment of metropolitan regions to deal with massive urban systems problems, (2) massive financial incentives, and (3) direct federal assumption of metropolitan responsibilities. The regional authority should be responsive to local interests and needs with specific functions well defined in its statutes. General implementation procedures such as public hearings, adaptation of plans, review of independent planning activities and establishment of priorities, and creation of a central billing office for handling water and disposal of solid waste charges are discussed. Specific projects are described including timing of their implementation, and cost estimates. (Elfers-North Carolina)
W73-14242

MICROBIOLOGY OF WASTE TREATMENT,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 05D.
W73-14261

REDUCTION AND EVALUATION OF BIOLOGICAL DATA,
Environmental Protection Agency, Ada, Okla. Office of Technical Programs.
For primary bibliographic entry see Field 05A.
W73-14310

RESEARCH AND DEVELOPMENT IN INDUSTRIAL CORPORATIONS: CAN ADVANCED SOCIETIES LEARN TO CONTAIN POLLUTION,
Minnesota Univ., Minneapolis. Dept. of Sociology.
R. E. Rickson.
Available from the National Technical Information Service as PB-223 504, $3.00 in paper copy, $1.45 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 62, August 1973. 23 p, 34 ref. OWRR B-047-MINN (1). 14-31-0001-3294.

Descriptors: *Decision making, Pollution, Control, *Minnesota, Organization, Environmental effects, Industries, *Research and development, Social change.
Identifiers: *Policy decisions.

The development and distribution of knowledge has long been of interest to policy-makers and social scientists. Because of the power of industrial corporations and the influence they have over the general research and development process, societies have the knowledge to deal with problems that coincide with corporate goals but have difficulty handling problems where solutions are, in the short run, contradictory to the uninterrupted pursuit of economic goals. A good example is societal ability to deal with waste or pollution. Two processes are important: (1) the process by which resources are allocated to research at the corporate and societal level and (2) the management of the expert role by organizations. (Walton-Minnesota)
W73-14365

PHOSPHORUS REMOVAL BY TRICKLING FILTER SLIMES,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-14372

ULTIMATE MANAGEMENT OF RADIOACTIVE LIQUID WASTES,
Idaho Nuclear Corp., Idaho Falls.
C. M. Slansky, and J. H. Buckham.
Chemical Engineering Progress Symposium Series No. 97, Vol 65, 1969, p 26-31, 6 fig, 2 tab, 17 ref.

Descriptors: *Radioactive waste disposal, *Nucelar power plants, *Electric power production, Public health, Food chains, Liquid wastes, Separation techniques, Transportation, Storage, Ultimate disposal, Radioisotopes, Water quality control, *Waste disposal.
Identifiers: *Transmutation, Half-life.

An estimated 7950 metric tons of fission products will result from nuclear electric power generation in the year 2000, if current trends continue. Development of nuclear processes is such that an economical method of ultimate disposal of such wastes has not been developed, although if such a method had been developed it would undoubtedly be obsolete in 30 years anyway. Therefore, the problem to be faced now is interim storage of waste products so that the short-lived radioisotopes can decay and the long-lived radioisotopes can be retrived for ultimate processing. The processes, both storage and ultimate processing, should also be within the means of smaller developing nations which desperately need the nuclear power. Methods of ultimate disposal currently being investigated include transmutation to stable isotopes in a nuclear reactor, and transportation by rocket to the sun or other suitable locations. Ultimate storage in ocean trenches and deeps has been proposed and is being investigated. Current practices of interim storage include mainly underground storage of liquid or solid containerized wastes. Further extensive testing is needed for all phases of both disposal, ultimate storage and interim storage to protect the environment from serious damage. (Lowry-Texas)
W73-14390

LOW LEVEL BOD DETERMINATIONS BY THE ELECTROLYSIS METHOD,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 05A.
W73-14391

CANADA ANIMAL WASTE MANAGEMENT GUIDE.
Department of Agriculture, Ottawa (Ontario). Animal Waste Management Guide Committee.

1972, 57 P, 9 TAB., 4 FIG., APPEND.

Descriptors: *Farm wastes, *Livestock, *Production, *Design, *Management, Pollution, Manure utilization, Nitrogen, Farm lagoons, Aerated lagoons, Aerobic treatment, Anaerobic digestion, *Waste treatment, *Waste storage, *Waste disposal, Dehydration, Incineration, Zoning, Regulations, Legal aspects, Equipment, Fertilizers, Canada.
Identifiers: *Canadian legislation, Dead bird disposal, Composting.

Current Canadian practices which provide reasonable approaches to handling animal wastes were compiled with particular emphasis on using the land as a recycling system. Detailed information is given for (1) manure management, (2) utilization of manure handling systems, and (4) processing of animal wastes. Relevant legislation on animal waste management in each province and addresses of equipment manufacturers are also included. (Dudley-East Central)
W73-14392

THE NATURE OF CHEMISTRY IN THE NATIONAL SEA GRANT PROGRAM,
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 02K.
W73-14397

PRODUCTION, POLLUTION, PROTECTION,
For primary bibliographic entry see Field 05B.
W73-14430

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON PRIMARY PRODUCTION AND ZOOBENTHOS OF EL CAPITAN RESERVOIR, CALIFORNIA,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W73-14444

MODELS FOR MANAGING REGIONAL WATER QUALITY,
Harvard Univ., Cambridge, Mass. Harvard Water Program.

Harvard University Press, Cambridge, Mass., 1972. R. Dorfman, H. D. Jacoby, and H. A. Thomas, Jr., Editors. 453 p.

Descriptors: *Mathematical models, *Water quality control, *Municipal water, River basins, Estuaries, *Mangement, *Decision making, *Optimization, Political aspects, *Regional analysis, Analytical techniques, Stochastic processes, Multiple-

purpose reservoirs, Economics, Technology, Waste water treatment, Tertiary treatment, Systems analysis.
Identifiers: Biochemical pollution, Human wastes, Artificial aeration, Public agencies, Delaware Estuary.

Nine essays are presented on various aspects of water quality control in a basin or estuary. They are unified by the conviction that the social and technological aspects of the problem are inseparable. The emphasis throughout is on the development of analytical models that can encompass both the social and technological facets and explore the practicability of integrating the physical, economic, and institutional aspects of regional water management. Primarily, models suited to biochemical pollution, rivers and extuaries, and municipalities are discussed. Included are: (1) The pollution problem in a historical setting; (2) a linear programming model of political decision making applicable to water resource problems and applied to a hypothetical basin; (3) a model of municipal behavior under the uncertainty of supply; (4) uncertainty as it affects design and operating decisions made by public agencies; (5) dynamic programming to evaluate the use of artificial aeration to control dissolved oxygen in estuaries; (6) wastewater conveyance and regional treatment facilities; and (7) flow regulation for quality control, emphasizing political admissibility, and utilizing linear programming. (See W73-14458 thru W73-14466) (Bell-Cornell)
W73-14457

WASTE DISPOSAL IN NATURAL WATERWAYS,
Harvard Univ., Cambridge, Mass. Dept. of Sanitary Engineering.
H. A. Thomas, Jr.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H. D. Jacoby, and H. A. Thomas, Jr.), Harvard University Press, Cambridge, Massachusetts, p 1-41 (Chapter 1), 1972. 4 fig, 10 tab, 31 ref.

Descriptors: *Water pollution control, *Natural streams, *Waste disposal, *Mathematical models, Water quality, Analytical techniques, Sanitary engineering, Industrial wastes, History, Ecology, Management, *Regional analysis, Massachusetts, Equations, Hydrologic data, Biomass, Lakes, Estuaries, Reaeration, Biochemical oxygen demand, Systems analysis, Economics.
Identifiers: *Biochemical pollution, Human wastes, Dilution, Natural purification, Pollution load, Synecology, Streeter-Phelps formulation.

This essay provides a broad perspective of the pollution problem in an historical setting. Methods of analysis of stream pollution problems are described with three objectives: (1) To discuss the ecological principles on which the methods are based; (2) to comment on the reliability of predictions relating pollution load to water quality, and to indicate gaps in present knowledge; and (3) to examine limitations of the water-carriage system of waste disposal with further economic growth. Developments are presented in historical sequence, with advanced theories interpolated to provide perspective relating to strengths and limitation of current sanitary engineering practice based largely on investigations of the U.S. Public Health Service during the early 20th Century. Subsequent improvements of the classical theory are then outlined, and recent research trends in areas where present methods are unsatisfactory are indicated. Special attention is given to biochemical pollution from human and industrial wastes and to the empirical basis of the mathematical models commonly used to describe this phenomenon. As an introduction to the mathematical analysis of water pollution, a water pollution crisis that arose in Massachusetts at the the turn of the century is examined. (See also W73-14457) (Bell-Cornell)
W73-14458

CONCEPTUAL MODEL OF A REGIONAL WATER QUALITY AUTHORITY,
Harvard Univ., Cambridge, Mass.
R. Dorfman.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H. D. Jacoby, and H. A. Thomas, Jr.), Harvard University Press, Cambridge, Massachusetts, p 42-83 (Chapter 2), 1972. 4 fig, 16 ref.

Descriptors: *River basin commissions, *Water quality, *Management, *Mathematical models, *Political aspects, Engineering, *Pollution abatement, Social aspects, Economics, Technology, Decision making, Data collections, Data processing, Evaluation, Systems analysis, Cost-benefit analysis, Benefits, *Regional analysis.
Identifiers: Constrained maximization, Prediction.

Water quality management decisions are reconciliations of diverging opinions and conflicting interests. This fact is almost universally ignored, however, in most discussions of water resource design and project evaluation. Consequently, there are no known methods of design which account for political considerations. The first of a pair of essays that endeavors to integrate social and economic considerations with the technical and engineering aspects of water quality management, this article proposes a model of political decision making applicable to water resource problems, and advocates its application to the analysis of pollution control institutions and projects. The model collects and organizes pertinent data, and predicts that certain initially conceivable decisions will not, in fact, be adopted. Described at some length is the milieu in which river basin authorities operate and the considerations that impinge upon their decisions. Discussed is how these considerations could be formalized and quantified; it is seen that the authority's decision problem can be expressed as a family of formal mathematical problems involving constrained maximization. It is deduced that benefit-cost analysis presupposes the agency 'knows best' what the objectives of society are with respect to matters within its jurisdiction, and can arrive at decisions without consulting the citizens concerned. (See also W73-14457 and W73-14460) (Bell-Cornell)
W73-14459

AN ILLUSTRATIVE MODEL OF RIVER BASIN POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass.
R. Dorfman, and H. D. Jacoby.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H. D. Jacoby, and H. A. Thomas, Jr.), Harvard University Press, Cambridge, Mass., p 84-141 (Chapter 3), 1972. 6 fig, 11 tab, 5 ref, 1 append.

Descriptors: *River basin commissions, *Water pollution control, *Management, *Political aspects, *Mathematical models, Standards, *Water quality standards, Decision making, Costs, Municipal wastes, Industrial wastes, *Regional analysis, Technology, Planning, Systems analysis.

That water quality management decisions are reconciliations of diverging opinions and conflicting interests is almost universally ignored in most discussions of water resource design and project evaluation. Consequently, there are no known methods of design which account for political considerations. The second of a pair of essays that endeavors to integrate social and economic considerations with the technical and engineering aspects of water quality management, this article tests a conceptual model of political decision making applicable to water resource problems by applying it to a hypothetical river basin. Several municipal and industrial dischargers contribute to the generally poor quality of the sample river; most of these same agents, along with others, both inside and outside the basin, have an interest in bringing the river to a higher quality standard. The questions are how high a standard to strive for and who should bear the cost of achieving it. The model collects and organizes pertinent data, and predicts that certain initially conceivable decisions will not, in fact, be adopted. The model focuses on a pollution control commission charged with formulating and implementing a plan for the basin and on the way economic and technical factors combine with political considerations to influence commission decisions. (See also W73-14457 and W73-14459) (Bell-Cornell)
W73-14460

MUNICIPAL EVALUATION OF REGIONAL WATER QUALITY MANAGEMENT PROPOSALS,
Resources for the Future, Inc., Washington, D.C.
C. S. Russell
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H. D. Jacoby, and H. A. Thomas, Jr.), Harvard University Press, Cambridge, Mass., p 142-203 (Chapter 4), 1972. 9 fig, 12 tab, 46 ref, 1 append.

Descriptors: *Water quality control, *Benefits, Estimating, *Evaluation, *Mathematical models, *River basin commissions, *Decision making, Alternative planning, Political aspects, Human population, Water supply, Water treatment, Costs, Aesthetics, Recreation facilities, Cost-benefit theory, Financing, Cost sharing, Municipal water, Chemicals, Biochemical oxygen demand, Equations, Systems analysis, *Regional analysis.
Identifiers: Improvements, Interest groups, Nashua (N.H.), Dissolved minerals, Group benefits.

Presented is an approach to the problem of municipal evaluation of the benefits from local water quality improvements. The attitudes of municipal authorities are important influences on commission decision making. As a result, the analysis of basin-wide quality decisions requires an estimate of the value of alternative plans, as viewed from the standpoints of participating cities. Municipal authorities' acceptance or rejection of a regional scheme depends on their balancing of tis consequences for their various constituents, who enjoy city benefits but also must pay taxes. A model of municipal behavior in these circumstances is formulated and tested. The model and its implementation are discussed in two parts: (I) The identification of interest groups and the estimation of group benefits from various levels of quality improvement and of the group cost shares under alternative financing plans; and (II) the combination of these estimates within the framework of a political constraint and a set of relative group political weights (municipal willingness to pay for aesthetic improvement and increased recreational opportunities). An application of the model to Nashua, New Hampshire is presented. An appendix: 'Mineralization Damages to Water System Customers--Their Conceptual Role and Some Empirical Results' is included. (See also W73-14457) (Bell-Cornell)
W73-14461

OPTIMUM GOVERNMENT INVESTMENT IN SUPPLY SYSTEMS YIELDING UNCERTAIN OUTPUTS,
S. J. Turnovsky.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H.D. Jacoby, and H.A. Thomas, Jr.), Harvard University Press, Cambridge, Mass., p 233-264 (Chapter 6), 1972. 2 fig, 14 ref.

Descriptors: *Governments, *Investment, *Management, Economics, *Design, *Optimization, *Stochastic processes, Estimating, Benefits, Marginal costs, Marginal benefits, Decision making, Equations, Mathematical models, Systems analysis, *Risks.
Identifiers: *Supply systems, Nonlinear programming, Consumers.

In water resources project development, one must account for inevitable uncertainties in system performance due to variation in the myriad system inputs and parameters. This is the second of a pair of articles which considers the special problem of uncertainty as it affects the design and operating decisions made by public agencies. This article considers the optimal planning of public investment and management schemes when there is a stochastic component in the pattern of goods they provide. Particular attention is paid to the estimation of benefit functions in this situation, and to the design of supply systems when output variance is subject to control. With the aid of a model based on consumer decision making where supplies are stochastically determined, a procedure for estimating the expected benefits from consuming such commodities is derived. The results are then used to determine the optimal price and design for a stochastic supply system; the optimization is performed in two steps: (1) determination of how to select specifications that will enable a supply system of a given quality to be achieved most economically; and (2) assuming an efficient design, the socially optimal price and the standard deviation, mean, and reliability of the supply are established. (See also W73-14457 and W73-14462) (Bell-Cornell)
W73-14463

ARTIFICIAL AERATION AS A SUBSTITUTE FOR WASTEWATER TREATMENT,
L. Ortolano.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H.D. Jacoby, and H.A. Thomas, Jr.), Harvard University Press, Cambridge, Mass., p 265-311 (Chapter 7), 1972. 4 fig, 4 tab, 34 ref.

Descriptors: *Water pollution control, *Tertiary treatment, *Aeration, *Dissolved oxygen, *Optimization, Model studies, Costs, *Numerical analysis, Management, Water quality, Standards, Dynamic programming, Alternative planning, Esturaries, Streams, Economies of scale, Equations, Systems analysis, Waste water treatment.
Identifiers: *Delaware Esturary, Computer algorithms, Cost functions, Sensitivity analysis.

Artificial aeration is the deliberate introduction of oxygen into a watercourse to enhance self-purification. Mathematical models are used to examine the role of artificial aeration as a substitute for tertiary treatment in the control of the dissolved oxygen levels of streams and estuaries. The models determine the location and sequencing of artificial aerators and tertiary treatment plants to meet the specified water quality standards at minimum cost. The models presented increase in complexity from a simple case involving only a single aerator location and no tertiary treatment, to a very general case involving an arbitrary number of aeration locations and waste sources. The simpler models are appropriate for individual municipalities or industries, while the more general models can be used for regional planning. Most of the cases discussed are illustrated by numerical examples based on data from the Delaware Estuary, somewhat simplified for ease of computation. The models consistently yieldsolutions favoring artificial aeration over tertiary treatment. Various sensitivity analyses indicate that aearation figures prominently in model solution even when aeration cost parameters are increased significantly. (See also W73-14457) (Bell-Cornell)
W73-14464

WASTEWATER CONVEYANCE MODELS,
T. Chi.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H.D. Jacoby, and H.A. Thomas, Jr.), Harvard University Press, Cambridge, Mass., p 312-361 (Chapter 8), 1972. 4 fig, 11 tab, 12 ref.

Descriptors: *Water quality control, *Waste water treatment, *Conveyance structures, *Pipes, *Treatment facilities, *Regions, Design, Management, Optimization, Economics, Technology, Costs, Size, Flow rates, Hydraulic gradient, Economies of scale, Scheduling, Investment, Methodology, Estuaries, Equations, Systems analysis.
Identifiers: Delaware Estuary, Cost functions.

Technological and cost functions pertaining to waste water treatment and conveyance are developed in a form appropriate for incorporation in a comprehensive model for regional management of water quality. The transporting of wastes to some combination of regional treatment plants, or piping them out to sea, is considered as an alternative to on-site waste removal. The model identifies efficient spatial and temporal patterns of wastewater treatment, conveyance, and ultimate disposal to receiving water at a stage in the over-all project design in which the principal waste sources have been determined, and decisions have been made regarding water quality in the streams. It accommodates several waste sources, treatment plants, and alternative discharge points; solutions give schedules of construction of control works and operation of the various components over a period of 20-30 years. The objective function includes cost of construction and operation of the various components discounted to the present. Used is a sample problem concerned with multiperiod planning of estuarine quality control and utilizing data from the Delaware Estuary. A modified form of Roger's technique of random sampling has been used in an application of the model to the polluted estuary. (See also W73-14457) (Bell-Cornell)
W73-14465

FLOW REGULATION FOR WATER QUALITY MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
D. P. Loucks, and H. D. Jacoby.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H.D. Jacoby, and H.A. Thomas, Jr.), Harvard University Press, Cambridge, Mass., p 362-431 (Chapter 9), 1972. 11 fig, 8 tab, 11 ref. OWR Projects C-1034 (No. 1575) (2) and C-1640 (No. 3151) (6).

Descriptors: *Political aspects, *Flow control, *Water quality control, *Linear programming, *Multiple-purpose reservoirs, *Management, Reservoir storage, Analytical techniques, Model studies, Evaluation, Streams, Waste treatment, River basins, Stochastic processes, Digital computers, Simulation analysis.

Flow regulation is considered as a means of quality control. A set of deterministic and stochastic linear programming models is developed to screen alternative multipurpose flow regulation schemes--and the associated waste treatment plans--in search of those few that warrant detailed analysis by digital simulation. A mathematical model of carbonaceous and nitrogenous biochemical pollution and a model of political decision making are combined to screen flow regulation and wastewater treatment alternatives according to the likelihood of their political admissibility, as well as their economic and technical feasibility. The models are applied to a hypothetical Bow River Valley planning problem developed in previous chapters of the book. (See also W73-14457) (Bell-Cornell)
W73-14466

CONCEPTS FOR EFFECTIVE MANAGEMENT OF WATER QUALITY IN CONNECTICUT,
Connecticut Dept. of Environmental Protection, Hartford.
R. B. Anderson.
University of Connecticut, Storrs, Institute of Water Resources Report No. 18, April 1973, 54 p, 16 fig, 41 ref.

Descriptors: *Water quality, *Water management (Policy), *Water pollution control, Economics, *Connecticut, Evaluation, Institutional constraints, Management.

The basic elements necessary for an effective water quality management program are presented with concept limitations. Economic factors are illustrated by comparing water quality management to a free market condition. Engineering considerations are discussed including mathematical water quality predictive models and other technical considerations. The behavior of local governments is analyzed as it relates to regional water quality management aspects. A conceptual approach with a real world example is presented for analyzing water quality management and waste treatment management problems. The example consists of a waste discharger and a downstream water user with minimum water quality requirements. Attempts to define least cost and cost effective pollution abatement strategies as well as to perform cost analyses of specified water quality standards are described.
W73-14471

MIDDLETOWN STREAMBELT REPORT.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W73-14484

SKETCH REGIONAL WATER AND SEWER PLAN.
Neuse River Regional Planning and Development Council, New Bern, N.C.
For primary bibliographic entry see Field 03D.
W73-14488

STUDY DESIGN FOR A REGIONAL SEWER AND WATER PLAN.
Cuyahoga County Regional Planning Commission, Cleveland, Ohio.
For primary bibliographic entry see Field 03D.
W73-14489

LANCASTER COUNTY PLANNING COMMISSION: STORM DRAINAGE STUDY.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 08B.
W73-14490

WATER, SEWER, AND STORM DRAIN STUDY, UTAH COUNTY, UTAH, VOLUME I: BACKGROUND AND INVENTORY.
Despain (I. Dale) and Associates, Provo, Utah.
For primary bibliographic entry see Field 05D.
W73-14492

WATER, SEWER AND STORM DRAIN STUDY, UTAH COUNTY, UTAH: VOLUME II, PLAN REPORT.
Despain (I. Dale) and Associates, Provo, Utah.
For primary bibliographic entry see Field 05D.
W73-14493

REPORT ON HALF MOON LAKE.
Half Moon Lake Restoration Committee, Eau Claire, Wis.

March 1973. 106 p, 5 fig, 12 tab, photos, 8 ref, append.

Descriptors: Water quality, *Water quality control, *Recreation, *Environmental effects, Water pollution, Nutrients, Financing, Shoreline cover, Fishing lakes, Effluents, *Wisconsin.

Identifiers: *Shoreline maintenance, Eau Claire (Wisc), Shoreline development, *Half Moon Lake (Wisc).

The Half Moon Lake Restoration Committee was created by the City of Eau Claire in 1971 to study the deteriorating quality of the lake and to determine ways to improve it. Lying entirely within the city limits, the lake, relatively shallow with a maximum depth of 9 feet, is a 132 acre ox bow cutoff of the Chippewa River. Renewal water comes from small springs, storm sewers, rain and snowfall. The Committee focused on questions of the history and quality of urban development on the five mile shoreline of the lake, sources of water and flow of water, water quality in the lake, recreational opportunities offered by the lake and adjacent park complex, and means of financing proposed improvements. The Committee views the Carson Park-Half Moon Lake complex as an extremely important recreation asset in the county and thus recommends a three-phase plan for improvement. Phase I consists of actions that can be undertaken immediately and will offer significant benefits. These actions include a shoreline maintenance program, a citizen clean-up campaign, land acquisition, wherein as much private ownership as possible should come under public ownership or public control. Scenic easements should be secured where purchase by the city is impossible. Phase II includes projects that require considerable study and investment including facilities to improve the water quality of the lake by using a well capable of delivery 2.5 mgd as a supplemental source to reduce nutrient content by flushing effect; provision of an iron removal process; removal of silt and oils from storm sewers by creation of sedimentation facilities. Phase III would include long term projects such as the construction of a dam to control silt entering the lake and the diversion of storm water runoff. (Elfers-North Carolina)
W73-14494

DES PLAINES RIVER VALLEY: GOALS, POLICIES, AND RECOMMENDATIONS.
Des Plaines River Valley Comprehensive Plan Steering Committee, Ill.
For primary bibliographic entry see Field 06F.
W73-14495

WATER AND LIQUID WASTE MANAGEMENT: POLICIES, SYSTEMS PLANS, PROGRAM.
Tulare County Planning Dept., Visalia, Calif.

Prepared for Tulare County Association of Governments, December 1971. 354 p, 26 fig, 6 tab, 46 plates, 6 append.

Descriptors: *Planning, *Water supply, *Sewerage, Environmental effects, Urbanization, Land use, Water demand, Projections, Financing, Coordination, Rural areas, *California.
Identifiers: *Urban growth policies, *Utility extension policies, *Tulare County (Calif), Kaweah River basin (Calif), Three Rivers (Calif).

The purpose is not only to plan for future county-wide water supply and wastewater disposal systems, but also to help formulate a county-wide growth strategy and face several crucial issues related to land use planning and environmental quality. This report is closely related to other elements of the County's General Plan and to the pilot study to develop a prototype Environmental Resources Management Element of a General Plan. Scope is limited to rural areas of the county, unincorporated communities and cities with a population of less than 5,500. These communities were classified as: Farm Labor Residential Community; Minor Rural Service Center; Major Rural Service Center; Municipality; Unincorporated Residential Tract; and Recreation Oriented and Retirement Community. Sections on the specific planning subareas and projections, evaluation of existing water supply and wastewater systems, future water demands and wastewater loads, water quality objectives, recommended management plans, and plan implementation, especially financing are presented. Some of the recommendations include the provision of water and sewer services only to communities with a favorable growth prognosis, the development of additional groundwater recharge facilities, the discouragement of scattered and fragmented systems, the extension of existing systems to promote orderly urban growth, the prohibiting of system extensions in airport zones, flood plains, aquifer recharge areas, and potential recreation areas, and the discouragement of the use of septic tanks. (See also W73-14498) (Elfers-North Carolina)
W73-14497

WATER AND LIQUID WASTE MANAGEMENT: POLICIES, SYSTEMS PLANS, PROGRAM--PART II.
Tulare County Planning Dept., Visalia, Calif.

Prepared for Tulare County Association of Governments, June 1972. 163 p, 31 fig, 26 tab, 2 append.

Descriptors: *Planning, *Water supply, *Sewerage, Environmental effects, Urbanization, Land use, Water demand, Projections, Financing, Groundwater recharge, *California.
Identifiers: *Urban growth policies, *Utility extension policies, *Tulare County (Calif), Central Valley Project (Calif), Dinuba (Calif), Tulare (Calif), Visalia (Calif).

This report is the second part of a very comprehensive effort to plan for future water supply and wastewater disposal systems for Tulare County, particularly in relation to issues of environmental quality and land use planning. It contains an overview of the growth pattern of three cities, Dinuba, Tulare and Visalia, whose urbanized acreage for each community is expected to double by 1990, and their key water supply and pollution problems. These cities are situated on the valley floor overlying an extensive underground reservoir which provides a potable water supply for domestic and municipal services. Planning factors such as socio-economic development, population, and land use are examined. An evaluation of existing water supply and wastewater systems, recommendations for expansion of these systems, and a discussion of financing and implementing these improvements are included. Some of the recommendations include the full support of the Central Valley Project which would convey water from the Sacramento area, the development of additional groundwater recharge facilities, the extension of central water and sewerage systems to promote orderly growth, the discouragement of septic tanks via zoning and subdivision regulations, the exclusion of sewer trunk lines from areas planned for agricultural and open space uses, and the adoption of ordinances requiring pretreatment of certain wastes at their source. (See also W73-14497) (Elfers-North Carolina)
W73-14498

WATER RESOURCES OF MIDDLE GEORGIA.
Briley, Wild and Associates, Daytona Beach, Fla.
For primary bibliographic entry see Field 06D.
W73-14499

MASTER PLAN FOR STORM DRAINAGE: FORT WAYNE-NEW HAVEN-ALLEN COUNTY METROPOLITAN AREA.
Schnelker (Philip L.), Inc., Fort Wayne, Ind.
For primary bibliographic entry see Field 06B.
W73-14500

AMARILLO, TEXAS: REPORT ON SANITARY SEWERAGE AND SEWAGE TREATMENT, 1967.
Freese, Nichols and Endress, Fort Worth, Tex.
For primary bibliographic entry see Field 05D
W73-14501

POLLUTION IN A NEO-CLASSICAL WORLD.--THE CLASSICS REHABILITATED.
S K Kuipers, and A Nentjes
The Economist, Vol 121, No 1, p 52-67, 1973. 3 fig, 4 ref.

Descriptors: *Theoretical analysis, *Pollution abatement, *Gross National Product, *Limiting factors, Economic efficiency, Mathematical models, Agriculture, Industries, Environment, Productivity, Employment.
Identifiers: *Pollution control costs, *Economic growth.

Increasing returns to industry and output growth resulting from technical progress, capital accumulation and working population growth is the basis of the neo-classical growth theory. The effect of the rising cost of economic growth now incurred by the recognized necessity of pollution abatement in this theory is investigated and a rehabilitation of the classical theory of growth is recommended. This would involve recognition of the environment as a scarce resource and, thus, the increasing costs of pollution could, under certain assumptions, place a limit on the growth output. A simplified model which associates pollution costs with capital stock and quantity of environment in a specific country and includes the possible effects of several forms of technical progress is employed. The analysis indicates that the neo-classical 'golden age' of continuous full employment is only a special case in which land-augmenting technology exceeds the growth rate of labor in efficiency units and the propensity to save is sufficently high. Under alternative parametric values the model generates a classical progressive state or a classical semi-stationary state. This analysis is compared to the Club of Rome's publication 'The Limits to Growth.' (Weaver-Wisconsin)
W73-14513

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: LEAD. PART I. INTRODUCTION AND EXECUTIVE SUMMARY.
Charles River Associates, Inc., Cambridge, Mass.

Available from the National Technical Information Service as PB-207 155, $3.75 in paper copy, $1.45 in microfiche. Report prepared for Council on Environmental Quality, December 1971. 21 p, 3 tab.

Descriptors: *Pollution abatement, *Economic impact, Air pollution, *Water pollution control, Costs, Zinc, Lead, Industries, Regulation.
Identifiers: *Lead industry, Sulfur dioxide, Market analysis, Industry organization.

A broad profile of the lead industry is presented including its market environment, technology, and internal structure. The probable economic effect and costs to meet the Environmental Protection Agency standards of sulfur dioxide emissions from smelters into the air and waste discharges into water are evaluated, giving estimates of long-run costs for attaining 90% feed sulfur removal. Although long-run consumption trends (growth at 1% per year) are not expected to be altered due to the relative price inelasticity of demand for lead and the small price increases required to finance pollution control costs, a loss of 40% of the tetraethyl market is expected by 1975 due to increased use of lead-free gasoline. Replacement of older mines and smelters and increased market concentration are expected supply trends, which will be accelerated as pollution control costs real-

locate supply from high- to low-cost producers due to the disproportionate incidence of these costs to high-cost producers. (See also W73-14517) (Weaver-Wisconsin)
W73-14516

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: LEAD. PART II. STRUCTURE OF THE INDUSTRY.
Charles River Associates, Inc., Cambridge, Mass.

Available from the National Technical Information Service as PB-207 156, $4.85 in paper copy, $1.45 in microfiche. Report prepared for Council on Environmental Quality, December 1971. 92 p, 2 fig, 4 tab.

Descriptors: *Industries, *Lead, Industrial production, Marketing, Prices, Mining, Regulation, Economic impact, Pollution abatement, *Missouri, Water pollution control.
Identifiers: *Industry structure.

General and specific characteristics of the lead industry and its market environment (including demand and supply conditions, the state of technology, the structure of the industry, price trends and industry-relevant governmental policies) are reviewed in order to provide a basis for the economic evaluation of pollution controls on the lead industry. Supply trends indicate that the U.S. is gaining an increasing share of world production due to low-cost technologies applicable to new deposits discovered in Missouri. Although mining costs vary considerably among firms, a typical company faces large fixed costs, sharply increasing short-run costs, and nearly constant average costs for moderate short-run output changes or substantial long-run changes. Smelting and refining, which account for the greatest proportion of costs in lead production are the greatest sources of pollution due to sulfur dioxide emissions and their relatively costly conversion to sulfuric acid. Lead consumption has increased at an annual rate of 1% due mainly to the battery industry, although a short-run decline in the tetraethyl market is expected. Because no close substitutes exist for lead, its demand is highly price inelastic, although inventory fluctuations associated with the business cycles and changes in capacity have caused periodic price instability. Increasing industry concentration is expected due to the introduction of large, high quality ore reserves in Missouri. A review of the industry indicates a natural division between high- and low-cost producers. (See also W73-14516) (Weaver-Wisconsin)
W73-14517

U.S. DEEPWATER PORT STUDY. VOL. 1. SUMMARY AND CONCLUSIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-14524

TRANSACTIONS OF THE 37TH NORTH AMERICAN WILDLIFE NATURAL RESOURCES CONFERENCE,
For primary bibliographic entry see Field 06G.
W73-14526

CHANGES IN BEACH PROFILES AT CHEDABUCTO BAY, NOVA SCOTIA, FOLLOWING LARGE-SCALE REMOVAL OF SEDIMENTS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Geoscience Center.
For primary bibliographic entry see Field 02J.
W73-14549

ENVIRONMENTAL EFFECTS OF HYDRAULIC DREDGING IN ESTUARIES,
Alabama Marine Resources Lab., Dauphin Island.
For primary bibliographic entry see Field 05C.
W73-14621

WATER RESOURCES IN SANTA CLARA COUNTY: A PLAN FOR CONSERVATION,
For primary bibliographic entry see Field 03D.
W73-14675

RIVERFRONT DEVELOPMENT PLAN, CONNECTICUT RIVER, SPRINGFIELD, MASSACHUSETTS.
Springfield Planning Dept., Mass.
For primary bibliographic entry see Field 03D.
W73-14676

WATER SUPPLY PLAN (REVISED) FOR COLUMBUS-FRANKLIN COUNTY,
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 06D.
W73-14679

HOWARD COUNTY, INDIANA: COMPREHENSIVE WATER AND SEWER PLAN.
Hamilton (Ernest R.) Associates, Inc., Indianapolis, Ind.
For primary bibliographic entry see Field 03D.
W73-14680

WATER AND WASTEWATER PLAN FOR ANDERSON, BLOUNT, AND KNOX COUNTIES, TENNESSEE - VOLUME I, WATER SUPPLY AND DISTRIBUTION.
Allen and Hoshall, Memphis, Tenn.

Report ET-SA-18-I-72 prepared for East Tennessee Development District, Knoxville, July 1972. 188 p, 18 fig, 59 tab, 2 append. CPA-TN-04-00-0136.

Descriptors: *Water supply, *Water distribution, Planning, Coordination, *Tennessee.
Identifiers: *Utility extension, *Knoxville SMSA, *Utility extension policies, Knoxville (Tenn), Anderson County (Tenn), Blount County (Tenn), Knox County (Tenn).

Water for the three-county Knoxville SMSA (Standard Metropolitan Statistical Area) is currently provided by twenty-eight separate utility systems, several of which provide inadequate service due to inadequate supply, inadequate treatment facilities, or inadequate distribution facilities. Only a few of these independent systems have formulated current or long-range plans regarding water supply and distribution. This study reports individually on the operations of each system. By means of population forecasts and land use maps, the study team predicted future water requirements in the area. Recorded flows show an abundance of surface water supply for the area's future needs. Land use and population projections would not justify a single regional water systems by 1990, but merger of several specific systems and establishment of three County Utility Boards to assure provision of recommended facilities in a coordinated and efficient manner are recommended. Cost estimates for each recommended project are given, and construction of specific facilities in each county at 5 year increments through 1990 is recommended. (See also W73-14683) (Stein-North Carolina)
W73-14682

WATER AND WASTEWATER PLAN FOR ANDERSON, BLOUNT, AND KNOX COUNTIES, TENNESSEE - VOLUME II, WASTEWATER COLLECTION AND TREATMENT.
Allen and Hoshall, Memphis, Tenn.

Report ET-SA-18-II-72 prepared for East Tennessee Development District, Knoxville, July 1972. 121 p, 8 plates, 30 tab, 4 append. CPA-TN-04-00-0136.

Descriptors: *Waste water treatment, *Sewerage, Septic tanks, Planning, *Tennessee.
Identifiers: *Waste water collection, *Knoxville (Tenn), Anderson County (Tenn), Knox County (Tenn).

Twelve wastewater utility systems now serve the three-county Knoxville SMSA (Standard Metropolitan Statistical Area), although public wastewater service is available only within municipal limits and in more densely inhabited areas of certain utility districts. Septic tanks are widely used, but present a hazard to the public welfare. Aside from insufficient territorial coverage, inadequacies of existing wastewater systems are attributable to excessive infiltration of surface water into collection systems or overloaded facilities brought on by new development. Few of the wastewater utility systems have current or long-range plans. High water-quality and effluent treatment standards promulgated by three state agencies constrain options for sewage treatment. Based on population and land-use forecasts, the study recommends specific wastewater service facility improvements through 1990. Population and land-use projections do not justify unified county systems, although County Utilities Boards are recommended to assure wastewater services on a coordinated, efficient basis. The study estimates costs of recommended projects and classifies all recommendations as short-range or intermediate-range priorities. Additional recommendations are county Sewer Use Ordinances and regulation of septic tanks. (See also W73-14682) (Stein-North Carolina)
W73-14683

ZERO DISCHARGE - THE ULTIMATE IN WATER CONSERVATION,
Battelle Inst., Geneva (Switzerland). Chemical and Environmental Engineering Systems Div.
For primary bibliographic entry see Field 05D.
W73-14684

BETTER WATER FOR PEOPLE IN LAS VEGAS,
Las Vegas Valley Water District, Nev.
T. R. Rice.
Journal of the American Water Works Association, Vol 65, No 4, p 229-231, April 1973. 3 photo.

Descriptors: *Water supply, *Water supply development, Pumping, Reservoir leakage, *Pollution abatement, *Nevada.
Identifiers: *Lake Mead (Nev), Southern Nevada Water Project, Las Vegas Valley Water District.

Although water for Las Vegas, whose population now exceeds 300,000 in the metropolitan area, originally came from several artesian wells, a lowered water table has long since caused the wells to cease their free flow. Today Las Vegas derives its water 57% from Lake Mead and 43% from well water. Since 1954, the Las Vegas Valley Water District has been operational as the prime supplier of water in Southern Nevada. Two years and over a million dollars have been spent for engineering and scientific studies of a water pollution problem caused by return flows entering Lake Mead via the Las Vegas Wash. A pollution-abatement program that will end pollution in Lake Mead and provide the means for reclaiming water for future use has been recommended to the state legislature. Unusual modern technology adopted by the Water District includes one of the largest gas-driven water-pumping stations in the world

and one of the largest rubber-lined covered reservoirs. Current 5-year expansion plans call for facilities costing $20 million to meet growing high per capita usage. (Stein-North Carolina)
W73-14688

ENVIRONMENTAL PROTECTION: NEW NAVY DUTY,
For primary bibliographic entry see Field 05D.
W73-14689

DISPOSAL OF OIL SPILL AT SEA,
O. B. Lindstrom.
U. S. Patent No. 3,749,667, 2 p, 4 ref; Official Gazette of the United States Patent Office, Vol 921, No 5, p 1910, July 31, 1973.

Descriptors: *Patents, *Oil pollution, *Oil spills, Separation techniques, *Pollution abatement, Treatment, Water pollution control, Water quality control, *Waste disposal.
Identifiers: Oil disposal.

A method is provided of clearing up an oil spill by causing combustion of the burned oil to produce a cokey and tarry floating residue which can subsequently be sunk by adding a sinking agent to it. The sinking agent particles (less than 50 mm in size) should be spread over the burning oil. The particles become coated with the floating oil residue and dense enough to sink through the water. The sinking agent particles may be sand, gravel, chalk, gypsum, or slag of heavy minerals. (Sinha-OEIS)
W73-14690

METHOD AND APPARATUS FOR REMOVAL OF SURFACE LIQUIDS,
Megator Pumps and Compressors Ltd., London (England). (assignee).
F. W. McCombie.
U. S. Patent No. 3,748,264, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 912, No 4, p 1530, July 24, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Separation techniques, *Pollution abatement, Water quality control, Water pollution control, *Skimming.

The apparatus comprises a barrier which is extendable and forms an enclosure which may be contracted or extended as needed. It comprises a flotable support, a pair of drive drums mounted on the support, an elongated resilient barrier strip wound about each drum, a rear wall that forms a barrier, and a flotation element connecting the ends of the strips and the rear wall. The apparatus is completed by a skimming apparatus that forms the subject of U. S. Patent application Ser. No. 114,157. It can pump away the surface layer without removing an appreciable amount of the underlying liquid. A centrally placed suction pipe passing through a perforated strainer plate is surrounded by a circular weir. The lower end of the pipe is positioned in a dish shaped chamber below the plate. A principal objective of both inventions working together is to remove the surface layer of oil which may be in the form of a thin film. (Sinha-OEIS)
W73-14692

COALESCING FILTERS FOR OIL-WATER SEPARATORS,
Brunswick Corp., Skokie, Ill. (assignee)
G. B. Peters.
U. S. Patent No. 3,743,599, 2 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 912, No 1, p 273, July 3, 1973.

Descriptors: *Patents, *Oily water, *Separation techniques, Filtration, *Filters, Emulsions, *Pollution abatement, Water quality control, Water pollution control, Coalescence.

A coalescing filter for an oil-water separator comprises a pair of spaced flanges on a perforated tube which serves as the bobbin for coalescing windings. A winding of multifilament nylon twisted yarn completely encloses the perforated tube. The nylon winding is impregnated with an oleophilic resin which provides some mechanical stability to the winding and, more importantly, serves as a base for establishing an oil-resin membrane. (Sinha-OEIS)
W73-14699

VORTEX FLOW SYSTEM FOR SEPARATING OIL FROM AN OIL-WATER MIXTURE,
United Aircraft Corp., East Hartford, Conn. (assignee)
A. E. Mensing, J. W. Clark, and R. C. Stoeffler.
U. S. Patent No. 3,743,095, 7 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 912, No 1, p 152, July 3, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Separation techniques, *Pollution abatement, Water pollution control, Water quality control.
Identifiers: Vortex flow system.

An oil-water mixture, which has been removed from the surface of an oil spill, is pumped into a vortex tube at one end at a very high flow rate so as to impart a strong swirl to the flow in the tube. A small circular coreplate is positioned within an aperture at the center of the opposite end of the vortex tube from which the mixture enters. As the mixture swirls axially toward the opposite end wall, the difference in centrifugal forces due to density differences between the oil and water tends to accelerate the less dense oil radially inward to form a core region almost entirely of oil. The oil leaves the vortex separator through a port in the center of the wall at the end of the vortex separator at which the mixture was injected. The flow surrounding the core, almost entirely water, leaves through the annulus in the downstream end wall and is returned to the body of water from which it was originally removed. (Sinha-OEIS)
W73-14700

SOIL EROSION--THE UNMENTIONED POLLUTER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02J.
W73-14720

A STUDY OF FORMATION PLUGGING WITH BACTERIA,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 08E.
W73-14732

ENVIRONMENTAL IMPACT REQUIREMENTS IN THE STATES,
Center for California Public Affairs, Claremont.
T. C. Tryzna.
Available from the National Technical Information Service as PB-223 748, $3.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-R5-73-024, June 1973. 20 p. EPA Contract 68 01 1818.

Descriptors: *Water quality standards, *State governments, *Environmental effects, Legislation, Legal aspects, Water quality control, Water Quality Act.
Identifiers: *Environmental Impact Statements, Water quality requirements, Ecological impact, *Environmental Protection Act.

The requirements of Environmental Impact Analyses for each of the various states has been surveyed. In eight states and in Puerto Rico, impact statements are a statutory requirement; in four states, they are required by Executive Order. In a few cases, the impact statement requirement extends to local as well as state agencies. (EPA)
W73-14749

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

OPTIMIZATION OF WATER RESOURCE SYSTEMS INCORPORATING EARTHQUAKE RISK: 1973 CONTRIBUTIONS,
California Univ., Los Angeles Dept of Engineering Systems
C. M. Duke, and S. E. Jacobsen.
Available from the National Technical Information Service as PB-223 359, $4.25 in paper copy, $1.45 in microfiche. California Water Resources Center, Davis, Contribution No. 141, June 1973. 113 p, 20 fig, 13 tab, 48 ref. OWRR B-146-CAL (2), B-107-CAL (2), B-122-CAL (1), and B-144-CAL (2).

Descriptors: Earthquakes, *Earthquake engineering, Planning, *Project planning, *Damages, Probability, *California, *Optimization, Model studies, Costs, *Water distribution (Applied), *Attenuation, Optimal development plans.
Identifiers: San Fernando, Los Angeles, San Francisco.

A three-part report covers several phases of the project: (1) A renewal theoretic model is developed for the purpose of evaluating expected future damage costs due to earthquakes for a segment of a water distribution system located in a large seismic region. A probabilistic model is used to obtain expected future damage costs as a function of design intensity and a numerical example is included to indicate the usefulness of the methodology. (by S. E. Jacobsen, M. Torabi and P. B. Bansal). (2) Occurrence of earthquakes in terms of space, size, and time distributions is combined with site functions to establish probability of levels of earthquake intensity at given sites in the Los Angeles and San Francisco areas of California. The method is applicable for decisions on optimizing the routing of aquedicts or other systems extending over large areas subject to seismic disturbance. (by N. K. Anderson and C. M. Duke). (3) An attenuation formula was derived for the Arias instrumental intensity on bedrock and constants in the formula were calibrated for the San Fernando earthquake (1971), using eight bedrock spectra derived from surface accelerograms. From the constant differences between four constrained attenuation curves, it is possible to define site factors to be applied to bedrock intensity in order to estimate surface intensity for zoning purposes. (by K. W. Campbell and C. M. Duke). (Snyder-California)
W73-14204

GUIDE TO THE PREPARATION OF OPERATIONAL PLANS FOR SEWAGE TREATMENT FACILITIES,
Synectics Corp., Allison Park, Pa.
For primary bibliographic entry see Field 05D.
W73-14214

THE ROLE OF URBAN ENGINEERING IN THE NATIONAL WATER POLICY ASSESSMENT,
National Water Commission, Arlington, Va. Engineering and Environmental Sciences Div.
For primary bibliographic entry see Field 06B.
W73-14235

THE COMPUTER-SYSTEMS APPROACH TO ENVIRONMENTAL PROTECTION, PLANNING AND MANAGEMENT: THE MALIBU WATERSHED,
California Univ., Los Angeles. School of Public Health.
For primary bibliographic entry see Field 05B.
W73-14371

MODELS FOR MANAGING REGIONAL WATER QUALITY,
Harvard Univ., Cambridge, Mass. Harvard Water Program.
For primary bibliographic entry see Field 05G.
W73-14457

MICROECONOMIC BEHAVIOR WHEN SUPPLIES ARE UNCERTAIN,
S. J. Turnovsky.
In: Models for Managing Regional Water Quality (ed. by R. Dorfman, H.D. Jacoby, and H.A. Thomas, Jr.), Harvard University Press, Cambridge, Mass., p 204-232 (Chapter 5), 1972. 2 fig, 23 ref.

Descriptors: *Economic analysis, *Decision making, *River basin commissions, *Water users, Behavior, *Water supply, Analytical techniques, Mathematical models, Prices, Consumptive use, Benefits, Stochastic processes, Design, Probability, Equations, Systems analysis, *Risks, *Regional analysis.
Identifiers: Public agencies, Micro-economic units, Production theory, Mean-variability analysis, Production function, Utility function.

In developing water resource projects, one must account for the inevitable fluctuation in system performance due to variation in streamflow, temperature, waste loads, equipment characteristics, and myriad other system inputs and parameters. Water users, in turn, respond to the level of uncertainty they experience, which affects the benefits that are propertly credited to alternative plans. Fairlure to consider this phenomenon can lead to serious errors in system design and evaluation. This is the first of a pair of articles which considers the special problem of uncertainty as it affects the design and operating decisions made by public agencies. This article explores the behavior of micro-economic units--households and productive farms--when the supply of some input is subject to uncertainty. A general, single-period model is developed which follows the mean-variability point of view and is essentially an extension of classical production (and consumption) theory. Then turning to the consumer, a parallel model is developed where the notation that previously referred to inputs is interpreted as applying to consumption goods. (See also W73-14457 and W73-14463) (Bell-Cornell)
W73-14462

OPTIMUM GOVERNMENT INVESTMENT IN SUPPLY SYSTEMS YIELDING UNCERTAIN OUTPUTS,
For primary bibliographic entry see Field 05G.
W73-14463

ARTIFICIAL AERATION AS A SUBSTITUTE FOR WASTEWATER TREATMENT,
For primary bibliographic entry see Field 05G.
W73-14464

WASTEWATER CONVEYANCE MODELS,
For primary bibliographic entry see Field 05G.
W73-14465

THE SOCIO-ECONOMIC DIMENSION OF WATER MANAGEMENT,
Battelle Memorial Inst., Columbus, Ohio. Regional Economics Div.
D. C. Sweet.
In: 'Dimensions of Water Management,' Proceedings of the 1st Annual Water Resources Conference, March 24, 1970, Columbus, Ohio, p 12-20, (1970). 2 fig.

Descriptors: *Optimum development plans, *Social values, Economics, Planning, Cost-benefit analysis, Administration, Water resources, Value, Decision making, *Management, Projections, Regions, River basin development, Economic impact, Model studies.
Identifiers: *Socio-economic impact, *Susquehanna River Basin, *Water management model.

An ideal water management methodology is described in order to provide a theoretical basis for evaluation and design of working processes. The Susquehanna River Basin model, an example of a water management process based upon the ideal, is presented. The elements which comprise the ideal system include inventory and compilation of data describing the various socio-economic, physical and ecological characteristics of the area. Thus, a notion of primary demand on existing water resources may be derived and compared with their potential for supply. The definition process of the goals for the system includes establishment of the social and economic value of various water resources. Finally, both the short- and long-run socio-economic impact of accomplishment of the goals must be estimated and evaluated. Cost-benefit analysis must be employed in selection of possible alternative means of achieving the prescribed goals. The Susquehanna River Basin model developed in Battelle-Columbus is considered as one of the few models which relates socio-economic components to the physical components of a water resource planning area. (Weaver-Wisconsin)
W73-14506

DES MOINES METROPOLITAN SANITARY SEWERAGE SYSTEM STUDY: PART B--MAIN SEWAGE TREATMENT PLANT.
Veenstra and Kimm, West Des Moines, Iowa.

Central Iowa Regional Planning Commission, Des Moines, December 31, 1971. 111 p, 8 fig, 12 tab, 5 appendices.

Descriptors: *Planning, *Sewage treatment, *Treatment facilities, Waste treatment, Forecasting, Alternative planning, Iowa, Financing, Tertiary treatment, Waste water treatment.
Identifiers: *Des Moines (Iowa).

Expansion of the sewage treatment plant to handle flows from all or parts of the Des Moines, Iowa, metropolitan area was investigated. This is part of a long-range comprehensive plan for collection and treatment of wastes in the Des Moines metropolitan area and covers topics of: (1) state and federal regulations, (2) the existing treatment plant, giving both existing loadings and capabilities, (3) future loadings predicted by type and geographical area, (4) recommendations as to routing and treatment of future loads, (5) alternative methods of providing additional treatment capacity, (6) construction cost estimates, and (7) financing costs of construction and operation. The existing plant was analyzed and found to be worth more than $12 million with a replacement value of over $20 million. It serves a population equivalent of the existing plant. (Poertner)
W73-14529

COMPREHENSIVE WATER AND SEWER PLAN: FREDERICK COUNTY, MARYLAND, VOLUME I.
Beavin Co., Baltimore, Md.

Frederick County Planning and Zoning Commission, Frederick, Maryland, 1969. 83 p.

Descriptors: *Planning, *Data collections, *Water supply, *Sewerage, Sewage treatment, Water treatment, Forecasting, Maryland, Comprehensive planning, Water resources development, Regional development, City planning.
Identifiers: Frederick County (Maryland).

A comprehensive water and sewer plan was prepared for Frederick County, Maryland. Existing systems were inventoried, projections were made of probable future demands, and recommendations for future systems are given. Total 1967 population was 92,100, and is expected to grow to 126,800 by 1980, 209,900 by the year 2000 and 2,127,000 by year 2070, at which time the county will be fully developed. The county has an area of about 670 square miles, of which approximately 34% is forest. Rainfall is about 42 inches a year, and is well distributed throughout the year. Water supplies are from the groundwater which is of good quality. Surface water is not used since streamflow is too dependent on rainfall. However, future development of water supplies calls for stream impoundments as well as further development of groundwater. A system of 20 water filtration plants is recommended, with interconnections to form a country-wide system. In 1969, about 50 percent of Frederick County was served by sewers. Water quality in the Monocacy River below the sewage treatment plant is presently unsatisfactory. Besides this plant, other sources of pollution comes from farm animals. A country-wide system of 28 treatment plants if recommended. Plants should remove at least 90 percent of the BOD; effluents should be used, rather than merely discharged; and animal sanitation should be improved. (Poertner)
W73-14530

METROPOLITAN COMPREHENSIVE WATER, SEWAGE, AND SOLID WASTE PLANNING: VOLUME I--BACKGROUND.
Bi-State Metropolitan Planning Commission, Rock Island, Ill.

March, 1970. 139 p, 17 fig, 22 tab, 1 appendix.

Descriptors: *Planning, *Water supply, *Sewerage, *Sewage treatment, *Solid wastes, Comprehensive planning, Iowa, Illinois, Forecasting, Water resources development, Data collections, Regional development, City planning, Short-term planning, Long-term planning, Legal aspects, Geologic investigations.

A comprehesive inventory and analysis was made of water, sanitary sewerage, storm drainage and solid waste systems in the two-county, two-state planning region of the Bi-State Metropolitan Planning Commission. The region includes Scott County, Iowa and Rock Island County, Illinois. It covers 873 square miles and is bisected by the Mississippi River. Total population in 1967 was about 296,000 and is expected to increase to about 353,000 by 1985. This study covers the following topics: (1) an inventory of the existing facilities in every community in the planning area; (2) a determination of future utility needs; (3) an inventory of local geologic conditions; (4) an inventory of pertinent federal, state, and local legislation; (5) an analysis of the existing facilities in light of future needs, geologic conditions, and present legislation; (6) preparation of a comprehensive 1985 plan based on the analysis; and (7) formulation of a short-range development program to implement the plan to 1975. This volume covers background material relevant to the study, including: (1) applicable state, federal and local laws, (2) federal agencies doing work in the subject areas, (3) federal grants-in-aid, (4) physical features in the study area, (5) methodology used for predicting future needs, (6) goals and objectives of the types of service studied. (Poertner) (See also W73-14532 and W73-14533)
W73-14531

METROPOLITAN COMPREHENSIVE WATER, SEWAGE, AND SOLID WASTE PLANNING STUDY: VOLUME II--INVENTORY ANALYSIS AND PLAN.
Bi-State Metropolitan Planning Commission, Rock Island, Ill.

March, 1970. 323 p, 74 fig, 35 tab, 1 append.

Descriptors: *Planning, *Water supply, *Sewerage, *Sewage treatment, *Solid wastes, Comprehensive planning, Iowa, Illinois, Forecasting, Water resources development, Data collections, Regional development, City planning, Short-term planning, Long-term planning, Legal aspects, Geologic investigations.

The Bi-State Metropolitan Planning Commission prepared this report to inventory and analyze existing water supplies, sanitary sewerage, storm drainage, and solid waste disposal. This report includes the following: (1) an inventory of the existing facilities in every community in the planning area: (2) a determination of future utility needs; (3) an inventory of local geologic conditions; (4) an inventory of pertinent federal, state, and local legislation; (5) an analysis of the existing facilities in light of future needs, geologic conditions, and present legislation; (6) preparation of a comprehensive 1985 plan based on the analysis; and (7) formulation of a short-range development program to implement the plan to 1975. This volume contains the inventory and analysis of existing systems and the plan for future systems. In 1967, the population of the 873 square mile region was about 296,000; by 1985 it is expected to grow to about 353,000. About 80 percent of all water comes from the Mississippi River and a problem is arising from the pollution by coliform bacteria, which has increased over 6 times from 1959 to 1964. It is recommended that existing water treatment plants be expanded to serve all areas within the central urbanized areas with water from the Mississippi River. Sanitary sewage facilities serve about 260,000 people, providing various levels of sewage treatment. Expansion of the service areas is recommended. Storm sewer plans call for separation of sewers in the large communities--the smaller communities are financially incapable of providing such sewers. Detailed study of solid waste problems is recommended. (Poertner) (See also W73-14531)
W73-14532

METROPOLITAN COMPREHENSIVE WATER, SEWAGE, AND SOLID WASTE PLANNING STUDY: VOLUME III--SHORT-RANGE DEVELOPMENT PROGRAM.
Bi-State Metropolitan Planning Commission, Rock Island, Ill.

March, 1970. 75 p, 35 tab.

Descriptors: *Planning, *Water supply, *Sewerage, *Sewage treatment, *Solid wastes, Comprehensive planning, Iowa, Illinois, Forecasting, Water resources development, City planning, Regional development, Short-term planning, Legal aspects, Geologic investigations.

The Bi-State Metropolitan Planning Commission, prepared a study on an inventory, analysis and plans for water, sanitary sewerage, storm drainage, and solid waste management. This volume covers the short-range development plan of the program which included the following topics: (1) an inventory of the existing facilities in every community in the planning area; (2) a determination of future utility needs; (3) an inventory of local geologic conditions; (4) an inventory of pertinent federal, state, and local legislation; (5) an analysis of the existing facilities in light of future needs, geologic conditions, and present legislation; (6) preparation of a comprehensive 1985 plan based on the analysis; and (7) formulation of a short-range development program to implement the plan to 1975. The report is composed of three major sections: (1) financial resources available, including current revenues, methods of borrowing, grants-in-aid and other financial considerations; (2) specific program proposals for 1970-1975, covering 453 projects costing a total of $83,146,000 (excluding solid waste management); and (3) additional general and specific program recommendations. Two major concepts recommended are: (1) enactment and enforcement of ordinances relative to the subject matter of this study, and (2) increased cooperation of local jurisdictions to solve common problems. (Poertner) (See also W73-14531)
W73-14533

WELLESLEY -- A CASE STUDY OF THE WATER RESOURCE PROBLEMS OF A GROWING SUBURBAN MUNICIPALITY,
Boston Univ., Mass. Dept. of Hydrogeology.
D. S. Hunnewell.
May 21, 1973. 40 p, 18 ref.

Descriptors: *Water resources development, *Forecasting, *Planning, *Water demand, *Water supply, Massachusetts, Water requirements, Dependable supply, Water shortage, Imported water, Political aspects, Institutions, Urbanization, Water contracts, Conservation.
Identifiers: *Wellesley (Massachusetts), Boston (Massachusetts).

The Town of Wellesley, Massachusetts, is an example of a town faced with an impending water shortage. An earlier study by a professional engineering company recommended that Wellesley develop additional groundwater supplies rather than join the Metropolitan District Commission of Boston. However, the State Attorney General ruled that these groundwater supplies were previously unused by Wellesley, and therefore, under State law, could not be developed. Furthermore, the State Department of Public Health ruled that the proposed wells: (1) were too close to existing sewers, thereby risking contamination, and (2) would lower water levels in a river which already was being artificially augmented. The alternative -- joining the MDC -- is not without problems since the cost of water is $120 per million gallons compared to the Wellesley rate of $40 per million gallons and the MDC is also facing possible water shortages in the near future. Wellesley is currently served by 7 wells with a sustained yield of 6.1 mgd, with projected demands for 1990 ranging from 5.0-5.3 mgd for an average, and maximum daily demands of about 9.25-9.81 mgd. A local conservation group has been formed and is promoting the conservation of water both voluntarily and through changes in water rates. Another study suggests that State laws and regulations on water development within the MDC are antiquated and Wellesley should be allowed to develop the wells recommended in the engineering study. (Poertner)
W73-14534

COMPREHENSIVE WATER AND WASTEWATER PLAN, 1969.
Baltimore City Dept. of Public Works, Md. Bureau of Engineering.

August 31, 1970. 86 p, 12 fig, 5 tab, 5 appendices.

Descriptors: *Comprehensive planning, *Water supply, *Sewerage, *Sewage treatment, Forecasting, Maryland, Water resources development, Water delivery, Water demand, Construction.
Identifiers: *Baltimore (Maryland).

A comprehensive water and wastewater plan was developed for the City of Baltimore to guide future development. Annual revisions of the plan are specified for presentation at public hearings, adoption by the mayor and city council, and approval by the State Health Department. The City of Baltimore derives its water from three surface sources--two reservoirs and the Susquehanna River. Three water treatment plants have a combined capacity of 360 mgd. Water distribution covers all of the City of Baltimore and parts of 3 adjacent counties, covering about 220 square miles. By the year 2000, it is estimated that the service area will cover about 700 square miles and will rely on increased water usage from the Susquehanna River. Recommended improvements to 1977 total $38,054,300 including $12 million for improvements to water filtration plants and over $19 million for improvements and extensions to water transmission mains. Pollution of Baltimore's waters is from 9 sources including: (1) commercial and industrial discharges, (2) septic tanks, (3) malfunctioning or inadequate treatment plants, (4) illegal sewer connections, (5) storm runoff, (6) marine craft, (7) leaching from dumps and landfills, and (8) natural sources. Significant commercial and industrial sources are known and efforts are being made to reduce this pollution. Other programs are directed against other forms of pollution, including upgrading of present treatment plants. (Poertner)
W73-14538

REPORT ON REGIONAL WASTEWATER TREATMENT FACILITIES FOR THE FREDERICK METROPOLITAN AREA, FREDERICK COUNTY, MARYLAND.
Baker-Wibberley and Associates, Inc., Hagerstown, Md

Frederick County Metropolitan Commission, Frederick, Maryland, January 31, 1973. 36 p, 3 fig, 7 tab.

Descriptors: *Planning, *Sewage treatment, *Treatment facilities, *Regional development, Alternative planning, Maryland, Waste water treatment, Financing.
Identifiers: *Frederick County (Maryland).

Various methods of providing additional wastewater treatment capacity to the Frederick, Maryland metropolitan area were studied and evaluated. The Frederick metropolitan area is projected to experience rapid growth with the area reaching almost total development by year 2000. Population in 1970 was about 38,500 and is expected to reach 169,000 by 2010. Wastewater flows were about 5.35 mgd in 1970, and in 2010 flows are expected to be about 17.70 mgd. The present treatment plant serving the City of Frederick is expected to be used to total capacity within 5 to 10 years. Four alternate sites were examined for sewage treatment plants along the Monocacy River. On the basis of cost, the most economical site was chosen and the report recommends that land acquisition and design begin immediately. Treatment by the activated sludge process is recommended, along with sludge incineration. Cost of the system is estimated at $5,881,000 (exclusive of land) for a plant capacity of 6.0 mgd, and federal and state grants of 87.5 percent of this cost are available. As an interim measure, it is recommended that suburban areas be allowed to hook up to the City of Frederick treatment plant. (Poertner)
W73-14541

AN ECONOMIC APPROACH FOR EVALUATING THE ADEQUACY OF HYDROLOGIC DATA,
Queen's Univ., Kingston (Ontario).
For primary bibliographic entry see Field 02A.
W73-14551

DESIGN OF HYDROMETRICAL NETWORKS AND APPLICATION TO COLOMBIA,
World Meteorological Organization, Bogota (Colombia).
For primary bibliographic entry see Field 02A.
W73-14552

AN APPLICATION OF THE INADEQUATE HYDROLOGICAL DATA OF THE AFRICAN TROPICAL REGIONS IN ENGINEERING DESIGN,
National Council for Scientific Research, Lusaka (Zambia).
For primary bibliographic entry see Field 02A.
W73-14553

IMPROVEMENT OF HYDROLOGICAL SERVICES IN BOLIVIA,
World Meteorological Organization, La Paz (Bolivia).
For primary bibliographic entry see Field 07A.
W73-14554

SHORT DURATION RAINFALL DEPTH-DURATION-FREQUENCY MAP OF INDIA,
Assam State Electricity Board, Barapani (India).
For primary bibliographic entry see Field 02A.
W73-14555

THE HYDROLOGICAL FEASIBILITY OF VARIABLE WATER SUPPLY POLICIES,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 02A.
W73-14570

OPTIMAL POLICY FOR RESERVOIR MANAGEMENT,
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 04A.
W73-14666

BASIC CONCEPTS IN SYSTEM PLANNING OF WATER RESOURCES,
Roorkee Univ. (India). Water Resources Development Training Centre.
M. K. Singhal.
Indian Journal of Power and River Valley Development, Vol 23, No 2, p 36-38, February 1973. 1 fig, 5 ref.

Descriptors: *Water resources, *Planning, *Systems analysis, *Optimization, Simulation analysis, Storage, Dams, Reservoir releases, Economic efficiency, Linear programming, Decision making, Methodology, Computers, Analytical techniques, Mathematical models, *Optimum development plans.

Man is confronted with the problem of planning in the face of increasingly limited resources. The concept of system planning provides a powerful tool for optimal planning of water resources. A system is defined as an integrated assembly of independent and interdependent components designed to carry out a predetermined function. The development of the systems approach is traced and its use illustrated by formulating a simplified mathematical model which uses linear programming and simulation analysis for hypothetical planning of a storage dam. Types of mathematical models are discussed and the steps in system planning are outlined. The hypothetical planning problem is to determine the desirable storage and the target annual output reservoir release for achieving economic efficiency. (Bell-Cornell)
W73-14667

EFFECTIVENESS OF THE OPTIMIZATION OF THE INPLANT REGIMENS OF HYDROELECTRIC PLANTS,
For primary bibliographic entry see Field 08C.
W73-14668

INVESTMENT CRITERIA AND MATHEMATICAL MODELLING TECHNIQUES FOR WATER RESOURCES PLANNING IN ARGENTINA: THE MIT-ARGENTINA PROJECT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. C. Major.
In: Systems Approaches to Developing Countries, Proceedings of Symposium, sponsored by International Federation of Automatic Control and the International Federation of Operational Research Societies, Algiers, Algeria, May 28-31, 1973, p 235-239, 1973. 2 fig, 11 ref.

Descriptors: *Water resources, *Planning, *Mathematical models, *River basins, Irrigation, Water supply, Hydrologic models, Simulation analysis, Stochastic processes, Investment, Management, Economics, Research, Social aspects, Systems analysis.
Identifiers: *Argentina, Rio Colorado, Power production, Developing countries.

A research program at MIT for the application of modern investment criteria and mathematical modeling techniques for water resources planning in Argentina is described. The project lasted for two years and had three principal objectives: (1) To adapt modern water resources planning techniques to Argentina; (2) to train Argentine professionals in the use of these techniques; and (3) to apply the techniques to a basin in Argentina for the purpose of developing alternative management and development plans for the river responsive to alternative economic and social objectives. The key organizational features of the MIT-Argentina program are described; the nature of modern water resources planning methods is outlined, the two central elements being multiobjective planning and the combined use of mathematical programming models and hydrologic simulation models. The basin selected for study is the Rio Colorado where present purposes of development are creating and enlarging irrigated zones and producing power. A description is presented of the system models used in the case study. Included are: A mathematical programming screening model to find configurations testable for hydrologic feasibility by the second model, a hydrologic simulation model; and a mixed integer 'sequencing' model utilizing the results of the first two models to develop the appropriate scheduling of hydrologically feasible projects over time. (Bell-Cornell)
W73-14670

CONSTRAINTS AND STRATEGIC CHOICES IN WATER SUPPLY INVESTMENT,
Wye Coll., Ashford (England). School of Rural Economics and Related Studies.
I. D. Carruthers.
In: Systems Approaches to Developing Countries, Proceedings of Symposium, sponsored by International Federation of Automatic Control and the International Federation of Operational Research Societies, Algiers, Algeria, May 28-31, 1973, p 225-234, 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Water supply, *Investment, *Constraints, *Management, *Domestic water, *Decision making, Rural areas, Systems analysis, Public utilities, Economics, Engineering.
Identifiers: *Kenya (Africa), Developing countries, Resource scarcity.

Systems analysis appears to offer considerable operational value for the domestic water supply sector. This contention is examined in the context of the Kenya rural water program. Three aspects of the program are considered: (1) changes in the input mix; (2) changes in the process for installing and maintaining schemes; and (3) the requirements for feedback. It is concluded that the concepts, as well as the methods, of systems analysis would provide useful management input in a sector where technical engineering considerations tend to dominate decision making. It is found that special conditions obtain requiring more capital intensive methods, a new approach to budgeting, institutional evolution leading to a strong provincial organization, and a more comprehensive feedback of information to policy makers and management. (Bell-Cornell)
W73-14671

GUIDELINES FOR SYSTEMS PLANNING INVESTIGATIONS AND OPTIMUM UTILIZATION OF WATER RESOURCES AND NORMS IN A DEVELOPING AREA,
Madhya Pradesh Government Control Board for Major Projects, Bhopal (India).
D. R. Sikka.
In: Systems Approaches to Developing Countries, Proceedings of Symposium, sponsored by International Federation of Automatic Control and the International Federation of Operational Research Societies, Algiers, Algeria, May 28-31, 1973, p 463-465, 1973.

Descriptors: *Water resources, *Optimum development plans, *Alternative planning, *Systems analysis, River basins, Water utilization, Economics, Engineering, Management, Decision making, Mathematical models.
Identifiers: *Developing countries, Power planning.

In planning water resource projects in developing countries, it is necessary to account for the size and scope of the needs of the area. The planning involves a large number of choices, assumptions and uncertainties in both engineering and economics; even after accounting for the technological constraints of topography and location, several alternative schemes of development with varying capacities and operating policies, technological features, and time streams of development are possibilities for meeting the various water derivative demands. These have to be considered in totality and in conjunction with power planning. Systems approach presents a variety of possible alternatives and their economic consequences, permitting optimal choice balancing the interest of the individual states as well as the region as a whole. Objectives of a proposed water resources systems study are enumerated; input and system studies are listed; and river basin planning for optimum water use and supplies, and area size for water resource exploitation are discussed. Needed are: (1) clear quantification of a country's size and time factors of growth rate; (2) an integrated management authority; (3) development under short, medium and long-term measures; (4) data collection and release programmes; and (5) development of surface and sub-surface waters according to time and finance limitations, for consumptive and non-consumptive uses. (Bell-Cornell)
W73-14672

MODELLING TECHNIQUES FOR A SYSTEM ENGINEERING APPROACH OF THE PROBLEMS OF WATER USES FOR AGRICULTURAL PURPOSES,
Padua Univ. (Italy). Instituto di Elettrotecnica e di Elettronica.
For primary bibliographic entry see Field 08B.
W73-14673

A SYSTEMS APPROACH TO SOLID WASTE MANAGEMENT IN ASIA: BANGKOK, THAILAND, AS A CASE STUDY,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05D.
W73-14674

6B. Evaluation Process

A STUDY OF MANAGERIAL PRACTICES IN RURAL WATER SYSTEMS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
P. Cartee, and D. C. Williams, Jr.
Available from the National Technical Information Service as PB-223 373, $4.50 in paper copy, $1.45 in microfiche. Mississippi State University, Mississippi State Water Resources Research Institute Report, July 1973. 125 p, 1 fig, 20 tab, 18 ref, 3 append. OWRR B-008-MISS (1).

Descriptors: *Management, Water supply, *Rural areas, *Mississippi, *Water management (Applied), *Operation and maintenance, Costs.
Identifiers: *Farmers Home Administration.

The rural community water system program of the Farmers' Home Administration was initiated in Mississippi in late 1962. The number of systems has grown until the total is now over 580, the second largest of all the states. Due to the rapid growth and the changing demands and standards placed on the systems, a study of the systems' managerial practices was deemed appropriate. Although many positive aspects were observed in the management of the systems, the emphasis was directed toward deficiencies in management. Specific deficiencies noted were: water operator qualifications and training; water quality surveillance and lack of in-house testing programs; cross-connection prevention programs; inflated initial memberships used in determining system feasibility; and lack of adequate internal business controls. Also of concern to this study were the relation of operating and maintenance costs per user to system size, the relation of contracted to in-house costs of operations and maintenance, and a case study of the effectiveness and efficiency of combining systems.
W73-14208

SOCIOLOGICAL DIMENSIONS OF LEISURE INVOLVEMENT IN WATER-BASED RECREATION,
Washington Univ., Seattle. Coll. of Forest Resources.
D. R. Field.
Available from the National Technical Information Service as PB-223 349, $3.50 in paper copy, $1.45 in microfiche. Project Completion Report, July 1973. 43 p, 2 fig, 11 tab, 67 ref. OWRR A-047-WASH (2).

Descriptors: *Social aspects, Methodology, *Recreation demand, *Attitudes, *Behavior, *Social participation, Motivation.
Identifiers: *Leisure, Social aggregate variables.

A baseline study was designed to identify essential sociological dimensions of participation in water-based activities. Objectives were: (1) To identify social groups participating in water-based recreation, as well as the social and economic characteristics of user-nonuser populations, (2) To identify variation among social groups participating in specific water-based recreation activities, (3) To determine in what manner involvement in specific water-based recreation is complementary or divergent from involvement in other outdoor leisure pursuits, (4) To compare similarities and differences among water-based recreational users and nonusers in terms of involvement in general patterns of leisure behavior. While data about user-nonuser populations were scarce, the general relationship of differences in terms of socio-demographic characteristics continued to be valid. With the wealth of data regarding participation, the question arose: why were predictive models of recreational demand misleading. The current research emphasis was shifted toward a systematic analysis of those factors associated with participation in a selected set of water-based activities wherein the results would have meaning for improving the predictive capabilities of models designed to measure recreation demand.
W73-14211

THE VALUE OF INFORMATION IN MAKING PUBLIC DECISIONS,
New Mexico Univ., Albuquerque. Dept. of Economics.
W. R. Porter.
Intermountain Economic Review, (1971). p 26-40, 1 fig, 3 tab, 9 ref. OWRR A-017-NMEX (1).

Descriptors: Model studies, *Costs, Planning, *Decision making, *Cost benefit analysis, *Benefits, Water resources development, Value.
Identifiers: Information value.

A viable and efficient sequential decision model was developed and tested which integrated information cost and stochastic benefits into the basic benefit-cost analysis for water resource project development. Given the very high costs of obtaining reliable estimates of benefits for water resource projects such a model could be very useful to government agencies wishing to get accurate benefit measurements but constrained by a limited budget for such information.
W73-14228

THE ROLE OF URBAN ENGINEERING IN THE NATIONAL WATER POLICY ASSESSMENT,
National Water Commission, Arlington, Va. Engineering and Environmental Sciences Div.
A. B. Bigler, and J. E. Flack.
September, 1971. 54 p, 2 append. OWRR A-013-COLO (2).

Descriptors: Engineering, *Systems analysis, *Water management, Model studies, Information exchange, Coordination.
Identifiers: *Interdisciplinary approach.

With the emergence of interdisciplinary approaches to help solve urban problems it has become necessary to clearly define the role of specific disciplines and the interrelationships among them. Engineering is basically responsible for physical-technological aspects of urban areas. Engineers have often been negligent of social and aesthetic issues but as members of a larger team looking at the total environment these problems can be overcome. As members of an interdisciplinary team, engineers would provide physical and operational criteria, alternative technical courses of action, and information on technological consequences. The team would take a systems analysis approach but there is a great need for 'social engineering' skills to catch up with physical engineering and model building. A model for integrated urban water management is proposed which consists of two key features: a water resources advisory service which acts as a focal point for research and social information, and an interdisciplinary team using a system analysis approach to plan an integrated water management system. (Elfers-North Carolina)
W73-14235

WATER QUALITY MANGEMENT PLAN FOR ALAMEDA CREEK WATERSHED ABOVE NILES.
Brown and Caldwell, San Francisco, Calif.
For primary bibliographic entry see Field 05G.
W73-14237

SHORELINE ANALYSIS OF THE CITY OF SARASOTA.
Smally, Wellford and Nalven, Sarasota, Fla.

Prepared for the Tampa Bay Regional Planning Council, May, 1970. 149 p, 10 fig, 46 ref. HUD Florida P-109.

Descriptors: *Shorelines, *Aesthetics, *Preservation, Land use, Urbanization, Shore protection, Environmental effects, Controls, Regulations, *Florida.
Identifiers: Shoreline preservation, *Sarasota (Fla), Shoreline impact zones.

A planning background and framework is provided for the maintenance of the special character and attractiveness of the Sarasota shoreline. The report is divided into three main parts: (1) a historical sketch of the development of the shoreline area including natural physical processes, Indian settlements, and the most recent urbanization processes; (2) a comprehensive look at the trends in land use and water use of specific areas of the shoreline and the Bay; and (3) a presentation of concepts and possible controls for the future development of the area. The basic finding is that the quality of the shoreline at present is very good but that planning and guidance is necessary to maintain this state. Various concepts and regulations are proposed: (1) delineation of shoreline impact zones, i.e. the strip of land directly on the waterfront plus an adjacent strip extending a fairly short distance inland, (2) concept of visual access be elevated to approach a public right, (3) controls for boating uses; (4) planned use of dredging spoil to create public islands, (5) protection of the bay ecosystem with special attention to halting pollution; and (6) updating of city code to control construction. (Elfers-North Carolina)
W73-14239

AREAWIDE COMPREHENSIVE WATER--SEWER PLAN, PART 2, PHASE I, 1970-1995, BREVARD COUNTY, FLORIDA.
Brevard Engineering Co., Cape Canaveral, Fla.
For primary bibliographic entry see Field 05G.
W73-14241

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME V. CAPITAL IMPROVEMENTS PROGRAM,
Diversified Consultants, Inc , Jackson, Miss.
For primary bibliographic entry see Field 05G.
W73-14242

PROCEEDINGS OF THE THIRD ANNUAL CONFERENCE ON REMOTE SENSING IN ARID LANDS.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 07B.
W73-14326

RESEARCH AND DEVELOPMENT IN INDUSTRIAL CORPORATIONS: CAN ADVANCED SOCIETIES LEARN TO CONTAIN POLLUTION,
Minnesota Univ., Minneapolis. Dept. of Sociology.
For primary bibliographic entry see Field 05G.
W73-14365

THE GRAND TRAVERSE BAY SPORT FISHERY: ANGLER ACTIVITY, REVENUE, AND ECONOMIC IMPACT,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. M. Kapetsky, and J. R. Ryckman.
Available from NTIS, Springfield, Va 22151 as COM-73-10462 - Price $3.00 printed copy; $1.45 microfiche. Michigan University Sea Grant Technical Report No 34, January 1973. 32 p, 2 fig, 7 tab, 11 ref. MICHU-SG-B-201.

Descriptors: *Sport fishing, *Freshwater fish, *Michigan, *Bays, *Economic impact, Water resources development, Recreation facilities, Tourism, Community development.
Identifiers: *Grand Traverse Bay (Mich).

Over a 1-year period, from May 1971 to May 1972, sport fishing activity in Grand Traverse Bay, Michigan, amounted to an estimated 69,000 angler days. Visitors to the area expended more than two-thirds of total angler activity. An estimated $418,000 of gross income attributable to the fishery resource accrued to the three-county community adjacent to the bay over the 1-year period, mostly from anglers using public launching sites and from charter fishermen. Net income to the community from sport fishing was estimated at $203,000. Business activity generated by sport fishermen created an estimated 21.5 full-time equivalent jobs which were attributable to the fishery resource. Included in the community are Antrim, Grand Traverse, and Leelanau Counties,

with a combined population of nearly 63,000 (U.S. Bureau of Census, 1970). Traverse City, at the southern end of the west arm of the bay, is the economic and cultural center of the community, with a population of about 18,000 (U.S. Bureau of Census, 1970). Tourism and recreation rank with manufacturing as leading economic activities in the region. (Woodard-USGS)
W73-14409

PROBLEMS OF WATER RESOURCES USE AND CONSERVATION (PROBLEMY VODNYKH RESURSOV, IKH ISPOL'ZOVANIYA I OKHRANY),
Institute of Geography of Siberia and the Far East, Irkutsk. (USSR).
G. V. Bachurin.
Institut Geografii Sibiri i Dal'nego Vostoka Doklady, No 26, p 61-69, Irkutsk, 1970. 18 ref.

Descriptors: *Water resources, *Water resources development, *Water utilization, *Water conservation, Water management (Applied), Water storage.
Identifiers: *USSR, Hydrosphere.

Data are presented on water storage in different parts of the hydrosphere and on water consumption resulting from human economic activity. Special attention is given to problems relating to utilization of natural waters by different branches of the USSR national economy, and prospects of development of water management in the USSR and problems of water conservation are discussed. (Josefson-USGS)
W73-14427

MUNICIPAL EVALUATION OF REGIONAL WATER QUALITY MANAGEMENT PROPOSALS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-14461

CONCEPTS FOR EFFECTIVE MANAGEMENT OF WATER QUALITY IN CONNECTICUT,
Connecticut Dept. of Environmental Protection, Hartford.
For primary bibliographic entry see Field 05G.
W73-14471

SKETCH REGIONAL WATER AND SEWER PLAN.
Neuse River Regional Planning and Development Council, New Bern, N.C.
For primary bibliographic entry see Field 03D.
W73-14488

STUDY DESIGN FOR A REGIONAL SEWER AND WATER PLAN.
Cuyahoga County Regional Planning Commission, Cleveland, Ohio.
For primary bibliographic entry see Field 03D.
W73-14489

PIGEON LAKE, PLANNING A RECREATIONAL RESOURCE.
Battle River Regional Planning Commission (Alberta).

December 1966. 27 p, 1 tab, 18 maps.

Descriptors: Recreation, *Recreation facilities, *Land use, *Planning, *Canada, Local governments.
Identifiers: *Resort community, Development plan, Local government reorganization, Implementation, Battle River Region (Alberta), Wetaskin County (Alberta), *Pigeon Lake (Alberta).

Pigeon Lake, a 35.25 square mile spring fed area with a water shed extending an average of 3 miles back from shore, is approximately 40 miles southwest of Edmonton and within a one hour time/distance radius with a total population of 458,000 of which 405,000 is urban. As background for the proposals developed, the study outlines related regional facilities including nearby lakes and means of access, existing land use area around the lake, density of current resort development along the edge, and the nature of existing land use controls. General principles of physical development are stated and a general recreational development plan is proposed, dealing with not only Pigeon Lake but also Battle and Wizard Lakes. Private and general public resort development is restricted to specific parts of the lakeshore, areas for wilderness recreational use are suggested, and much of the remaining shoreline would remain devoted to agricultural uses. A secondary road network is layed out. Requirements for adequate implementation of these proposals are explored with implications for the form of local municipal organization and a request that the Provincial Department of Municipal Affairs critically appraise the establishment of a new system of resort community government. Specific recommendations and numerous maps are included. (Edwards-North Carolina)
W73-14496

WATER AND LIQUID WASTE MANAGEMENT: POLICIES, SYSTEMS PLANS, PROGRAM.
Tulare County Planning Dept., Visalia, Calif.
For primary bibliographic entry see Field 05G.
W73-14497

WATER AND LIQUID WASTE MANAGEMENT: POLICIES, SYSTEMS PLANS, PROGRAM--PART II.
Tulare County Planning Dept., Visalia, Calif.
For primary bibliographic entry see Field 05G.
W73-14498

MASTER PLAN FOR STORM DRAINAGE: FORT WAYNE-NEW HAVEN-ALLEN COUNTY METROPOLITAN AREA.
Schnelker (Philip L.), Inc., Fort Wayne, Ind.

Prepared for The Three Rivers Co-ordinating Council, April 1972. 174 p, 5 fig, 4 tab, 16 plates, 3 append. CPA-IN-05-00-0130.

Descriptors: *Storm drains, *Storm runoff, *Rainfall-runoff relationships, Forecasting, Rational method, Urbanization, Land use, Watersheds, Design criteria, Correlation analysis, *Indiana.
Identifiers: Allen County (Ind.), Fort Wayne (Ind.), New Haven (Ind.).

A plan is formulated for the construction and improvement of all necessary storm drainage systems in Allen County, Indiana. Storm drainage systems must be built far in advance of full urban development; they will help facilitate orderly development. Focus is on forecasting future storm runoff, especially in relation to changing land use, and the engineering design of the systems. With regard to design criteria, such topics as runoff estimating methods, rainfall-runoff relationships, time of concentration criteria, and roughness coefficients are discussed. A detailed presentation is included of the runoff forecasting procedure used for the small watersheds in the county. Three basic methods were used: (1) interpolation of flood-frequency analyses was used for gaged streams; (2) modification of the Rational Formula method was used for ungaged basins of 500 acres or less; and (3) a Correlation Method, developed for the study, was used for basins over 500 acres. In the last two methods the key parameters used for local modification were drainage area, length of principal channel, vertical fall of principal channel, soil type, and projected land use. (Elfers-North Carolina)
W73-14500

OBION AND FORKED DEER RIVERS AND TRIBUTARIES, TENNESSEE AND KENTUCKY, INTERIM REPORT: HARRIS FORK CREEK.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W73-14502

EXTENDING THE ST. LAWRENCE SEAWAY NAVIGATION SEASON: THE COST-BENEFIT APPROACH,
Wisconsin Univ., Milwaukee. Dept. of Economics.

Descriptors: *St. Lawrence Seaway, *Navigation, *Cost-benefit analysis, *Ice, Technology, Economic impact, Transportation, Economic efficiency.
Identifiers: *Navigation season extension, Shipping.

Winter close-down prevents the St. Lawrence Seaway from realizing its true potential as a full service, low cost transportation route. Such close-downs weaken the Seaway's competitive position with overland-seaboard routes used as alternatives. A cost-benefit analysis, based on available data, of the possible extension of the operating season for two, four, and six weeks is presented. Coast Guard estimates of costs for season extension are employed because of their separation of ice breaking costs, construction costs, and increased annual costs. Estimated economic benefits include: cost savings for present traffic, the increased regional income due to new traffic, impact of diverted traffic, and the savings on the stockpiling of bulk cargo not shipped during the winter close-down. A four week extension was found to be the minimum necessary to generate significant transportation savings, although longer extensions are also economically justified. (Weaver-Wisconsin)
W73-14508

EFFECTS OF FISHING AND HUNTING EXPENDITURES ON A LOCAL COLORADO ECONOMY,
Montana Univ., Missoula. School of Forestry.
R. E. Lovegrove, and D. D. Rohdy.
The Annals of Regional Science, Vol 6, No 2, p 108-116, 1972. 4 tab.

Descriptors: *Economic impact, *Recreation, *Fishing, *Hunting, Regional economics, Model studies, Input-output analysis, Income analysis, Evaluation, *Colorado.
Identifiers: Game management, *Grand County (Colo.), Multiplier estimation, Impact optimization.

In order to both satisfy ever increasing demand for fishing and hunting and maximize economic impact of these activities, fish and game authorities must determine efficient expenditure schemes based on knowledge of the specific economic impacts of alternative public expenditures. The recreational impact is evaluated using a three-phase methodology based on data compiled from Grand County, Colorado. The methodology includes: (1) construction of an interindustry model of the country for 1968, (2) estimation of expenditures directly related to the pursuit of the sport (s), and (3) estimation of the total economic impact through consideration of both (1) and (2). Income multipliers were derived from the interindustry model. Results from mail questionnaires led to the estimation of sportsmen expenditures which indicated that fishermen, in aggregate, spent nearly eight times as much as hunters. Final analysis indicates that fishing accounted for 11.1% and hunting 1.4% of total economic activity in the county and that jointly they generated 21% of total direct, indirect, and induced household income. (Weaver-Wisconsin)

W73-14509

CLUSTER ANALYSIS AND WATER PROJECT EVALUATION,
South Dakota State Univ., Brookings. Dept. of Economics.
J. E. Wiebe.
Water Resources Bulletin, Vol 8, No 6, p 1189-1197, 1972. 10 fig, 1 tab, 2 ref.

Descriptors: *Project benefits, *Welfare (Economics), *Evaluation, Regional economics, Economic impact, *Tennessee River, Income, Employment, Water resources development.
Identifiers: *Cluster analysis.

Large-scale water projects are designed to generate positive economic and social benefits at their site. This study tested the hypothesis that income and employment benefits would be positively related to the areas where the projects were located. The research area was a 120-county region of the Tennessee River Watershed in the geographic location of the Tennessee Valley Authority. Cluster analysis was used to delineate counties in the watershed on the basis of changes in selected variables over time, weighted and divided for analysis into ten different combinations; these included 'Per capita income,' 'Total income,' 'Total employment,' 'Capital invested in manufacturing,' 'Percentage total population 25 years old and over with no school,' 'Percentage total population 25 years old and over with at least one year of college education,' and 'Percentage population in income category of $7000 and over.' Conclusions indicate that economic benefits can be assummed to be regional and not pronounced in counties adjacent to TVA. (Weaver-Wisconsin)
W73-14510

POLLUTION IN A NEO-CLASSICAL WORLD.--THE CLASSICS REHABILITATED,
For primary bibliographic entry see Field 05G.
W73-14513

ECONOMIC EVALUATION OF SPORT FISHERIES--WHAT DO THEY MEAN,
Slaney (F. F.) and Co. Ltd., Vancouver (British Columbia).
D. Gordon, D. W. Chapman, and T. C. Bjornn.
Transactions of American Fisheries Society, Vol 102, No 2, p 293-311, 1973. 4 fig, 13 tab, 23 ref.

Descriptors: *Recreation, *Fishing, *Value, *Economic impact, *Idaho, Decision making, Welfare (Economics), Resource allocation, Evaluation, Social values, Analytical techniques.
Identifiers: Demand estimation, Consumer surplus.

Techniques for valuation of sport fisheries were reviewed, compared and evaluated using a 1968 survey of anglers in Idaho. Based on the survey, the following measures of economic impact were estimated; (1) gross annual expenditures by sport fishermen, (2) net value and consumer surplus of various high quality sport fishery resources in Idaho, and (3) distribution of resident and non-resident fishing effort in the state. The survey provided daily expenditures and total days fished from which transfer costs spent by anglers were estimated, and demand curves simulated for eight fisheries in Idaho. On the basis of these curves maximum revenue (net value) and consumer surplus at the optimum daily angler fee were estimated. Results indicate a total net value of approximately $4.7 million and consumer surplus of $9.4 million associated with the eight fisheries. Comparison of techniques and results of the present study to others suggests that more consistent procedures would improve comparability of results. Although resource value was found to be unsatisfactorily estimated by gross expenditures, capitalized values may be useful. User-oriented worth of a fishery if were owned and marketed by a monopolist were approximated by estimates of net worth. (Weaver-Wisconsin)
W73-14514

A RATIONALE FOR THE REGIONALIZATION OF PUBLIC WATER SYSTEMS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
K. A. Boyd, and F. A. Bell, Jr
Water Resources Bulletin, Vol 9, No 1, p 73-80, 1973. 1 fig, 3 tab, 18 ref.

Descriptors: *Water works, *Potable water, *Consolidation, *Economic efficiency, Regions, Water rates, Public utilities, Legislation, Water delivery, Water quality standards, Cost analysis, Public health, *Regional analysis.
Identifiers: Small water utilities, Water service.

Studies of community water supply systems indicate that small systems have significantly more problems in their construction, operation, and in achievement of national Drinking Water Standards than do larger systems. The problem of analysing the economics of water service was simplified by studying costs of service, divided into personnel costs and capital costs, and water service rates for five example systems. In so doing, a rationale is set forth for requiring and/or encouraging the consolidation or regionalization of all systems serving populations beneath certain sizes. Minimal population sizes would be determined based on the small water systems' capability to produce an adequate supply of safe drinking water at reasonable cost. Estimates of basic costs and a range of water rates, thought to be acceptable to the customer, are used to determine public water system sizes which might be expected to achieve fiscal viability. Policy recommendations include both state and federal review of the extent and severity of small public water system problems and their resolution through consolidation or regionalization. (Weaver-Wisconsin)
W73-14515

WATER FOR THE FUTURE,
Ohio Agricultural Research and Development Center, Wooster.
T. L. Napier.
Ohio Report, Vol 58, No 2, p 57-59, 1973. 3 tab.

Descriptors: *Water resources development, *Sites, *Relocation, *Population, *Rural sociology, Social aspects, Social adjustment, Social impact, *Ohio, *West Virginia, Impoundments, Water supply, *Social impact.
Identifiers: Social attitudes, Social alienation, Watershed development.

The social-psychological impact of the expansion of water impoundments and subsequent population relocation upon rural community groups in Ohio and West Virginia were studied. The specific hypothesis tested stated that watershed development resulted in an alienated population. Four communities, carefully chosen to ensure comparability of the community groups, were sampled on a systematic random sample basis. An alienation attitudinal scale was constructed and pre-tested. The scale consisted of 21 Likert-type items intended to measure the affected groups' attitudes toward community leadership, other people in the group, personal estrangement from the community and basic satisfaction with the community. The results indicated that watershed development did not destroy people's perception of their community. However, physical displacement and subsequent community disruption leads to negative attitudes. (Weaver-Wisconsin)
W73-14520

FUTURE ALLOCATIONS OF LAND AND WATER: IMPLICATIONS FOR AGRICULTURAL AND WATER POLICIES,
Iowa State Univ., Ames. Center for Agricultural and Rural Development
For primary bibliographic entry see Field 06D
W73-14521

U.S. DEEPWATER PORT STUDY. VOL. I. SUMMARY AND CONCLUSIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
R. L. Trisko, P. Cheney, J. de Rover, J. C. Vlin, and B. Ahnert
Available from the National Technical Information Service as AD-750 090 $4.85 in paper copy, $1.45 in microfiche. Army Engineer Institute for Water Resources, Alexandria, Virginia, Final Report IWR 72-8, August 1972. 74 p, 4 tab. DACW 31-71-C-0045

Descriptors: *Environmental effects, *Harbors, *Ships, *Economics, *Oil, Offshore platforms, Channels, Navigable waters, Transportation, Ecology, Dredging, Economies of scale, Cost-benefit ratio, Foreign trade, Oil spills, Wetlands, Costs, Decision making, Risks, Design criteria, Benefit-cost analysis
Identifiers: *Deep-draft shipping, *Supercarriers, Dry bulk trade, Refineries, Crude petroleum, Water transshipment, Secondary economic effects.

The findings of an examination of the need for deep water ports and alternatives to accommodate deep-draft ships in U.S. trade are summarized. Benefits and costs of the alternatives are estimated based on consideration of their engineering, environmental and economic characteristics. Petroleum was found to dominate bulk commodities requiring extensive deepwater facilities in the future. Savings in transportation costs indicated that, in economic terms, the cost of developing alternative deepwater terminals would be justified. Offshore facilities located advantageously with respect to areas of high demand and to existing or feasible refinery areas are shown to be economically and environmentally preferable to channel dredging at existing terminals. Determination of optimal locations and capacities of deepwater ports is subject to uncertainities regarding specific requirements for additional refinery capacity. The potential economics of adapting ship sizes to channel condition by increasing capacity without increasing draft is emphasized. Deepwater transshipment ports on the East and Gulf Coasts for dry bulk goods seem economically unfeasible. Action on petroleum ports is urged, but is dependent on the establishment of an institutional mechanism to coordinate effective planning, design and control of their development and operation to eliminate or minimize environmental and ecological damage. (Weaver-Wisconsin)
W73-14524

THE LITANY OF SCARCITY VERSUS THE CHALLENGE OF ABUNDANCE,
Montana Univ., Missoula. School of Forestry.
R. W. Behan.
Journal of Soil and Water Conservation, Vol 28, No 2, p 50-51, 1973.

Descriptors: *Natural resources, *Food abudance, *Human population, Supply, Demand.

Traditional conceptions of natural resources based upon the belief that resources are a fixed inventory which could never adequately supply the world's ever growing population, that science and technology are agents of environmental degradation and that the standard of living is simply the ratio of fixed resources to growing population are refuted. First, history has shown the Malthus prediction to be the reverse of the reality--that productivity has increased geometrically while

population has only increased arithmetically and in many cases has stabilized. Secondly, technology is the set of value-neutral methods by which man choosen to transform resources to serve his needs. Finally, resources are not fixed inventories, but are a functional concept related to physical substance, utility perceived in the substanceand technology. Thus, resources as functional concept are not inherently limited and in place of a litany of scarcity we should recognize the challenge of abudance. This challenge involves making necessary changes such that abudance may be achieved and when achieved, properly distributed. (Weaver-Wisconsin)
W73-14527

RESOURCES FOR THE FUTURE, ANNUAL REPORT, FOR THE YEAR ENDING SEPTEMBER 30, 1972.
Resources for the Future, Inc., Washington, D.C.

(1972). 123 p.

Descriptors: *Environment, *Long-term planning, Social aspects, Human population, Energy, *Natural resources, *Human resources.
Identifiers: Resource adequacy, Energy crisis, Pollution, Demography, Resource availability, Energy consumption.

In addition to the year's accomplishments and the financial status of Resources for the Future, Inc, an essay by Joseph L. Fisher and two special articles are presented. The essay examines the dichotomy of interests held by environmentalists and those concerned with poverty. The issues are, in fact, interrelated and present common areas for amelioration. The first special article is based on recent RFF studies concerning energy and voices the need for a long-range, comprehensive set of national energy policies in order to divert a possibly impending energy crisis. The question of the relative importance of population growth as compared with economic growth, various forms of technology, and patterns of comsumption and their specific implications for pollution and resource availability are considered. Results indicate that population growth will have significant effects on resource adequacy, environmental quality and consequently, maintenance of the present way of life. Review of the year's work underscored the critical importance of energy consumption and its relation to environmental quality and a wide range of social and economic problems which can only hope to be solved with new methods of policy formulation. (Weaver-Wisconsin)
W73-14528

DECISION-MAKING IN WATER RESOURCE ALLOCATION,
Oregon State Univ., Corvallis.
C. Brown, J. G. Monks, and J. R. Park.
D. C. Heath and Co., Lexington, Massachusetts, 1973, 111 p. Price $10.00. OWRR B-016-ORE (3).

Descriptors: *Decision making, *Watershed management, Social aspects, Political aspects, Economics, Benefits, *Oregon, *Water allocation (Policy).
Identifiers: Junction City (Ore), Willamette Valley (Ore).

The Junction City project, or more correctly the Amazon Flat Creek Watershed development, was chosen, because it contained all levels of government participation and involved a degree of democratic input into the decision by the general populace. A local agency of government was created to administer and to manage the project. It was necessary to submit a tax base to the voters of the area, and therefore an election was held. This complete process from the local elections to gain local approval through the administrative processes of a bureaucratic system into the political system of the Congress provided an excellent vehicle for the study of decision-making in a compact situation. Very few persons actually participated in the decision process even though the democratic process provided them the legal right to do so. The information flow by those in authority and control did not permit appropriate development of opposition until it essentially became too late for such opposition to be effective. The legal channels of communication are inadequate even when they are supplemented by news stories and public hearings. Residents within the water control district perceive that a specific category of people is receiving the most benefit from the project. Understanding the nature of a public good and identifying advocates were found to be fruitful approaches to this study. The Junction City project was initiated as a flood control and drainage project, but when the concept of irrigation was introduced, some people began to look at the potential gain resulting from irritation more than at the potential loss resulting from floods and standing ground water. The local administrative unit (that is, the water control district) is composed of residents who act as directors but do not necessarily see themselves as government officials. The name of the local administrative unit was misleading to many residents.
W73-14609

STUDENT PROJECTS ON COASTAL ZONE AND OFFSHORE RESOURCES MANAGEMENT,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 02L.
W73-14615

A SYSTEMS APPROACH TO ASSESSMENT OF RURAL WATER SUPPLY PROGRAM EFFECTIVENESS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
R. J. Frankel.
In: Systems Approaches to Developing Countries, Proceedings of Symposium, sponsored by International Federation of Automatic Control and the International Federation of Operational Research Societies, Algiers, Algeria, May 28-31, 1973, p 241-246, 1973. 2 fig, 3 tab.

Descriptors: *Rural areas, *Water supply, *Evaluation, *Systems analysis, Methodology, Constraints, Resource allocation, Economics, Social aspects, Data collections.
Identifiers: *Effectiveness, *Developing countries, *Thailand, Scare resources, Information, Impact evaluation.

Methodology was developed to evaluate the effectiveness of Thailand's effort in providing potable water to rural communities and to demonstrate the improvements in impact evaluation made possible through application of systems analysis. Just as feasibility studies are necessary to evaluate the technical and economic acceptability of proposed projects, so are impact studies necessary to assess the economic and social effects of projects already undertaken. In Thailand, an impact evaluation was undertaken to analyze the effectiveness of the National Potable Water Project and to provide feedback to the government for improving the administrative, technical and operational aspects of the program. The methodology developed measured the social, economic and public health implications of the water projects towards achieving rural community development. The evaluation addressed the broad issues of whether the water systems have: (1) had a positive effect on community attitudes towards the local and central governments; (2) fostered economic growth; and (3) had a significant positive effect on water use habits and on the overall level of community health. Data are being collected from some 165 village projects throughout northeast Thailand. (Bell-Cornell)
W73-14669

GUIDELINES FOR SYSTEMS PLANNING INVESTIGATIONS AND OPTIMUM UTILIZATION OF WATER RESOURCES AND NORMS IN A DEVELOPING AREA,
Madhya Pradesh Government Control Board for Major Projects, Bhopal (India).
For primary bibliographic entry see Field 06A.
W73-14672

WATER RESOURCES IN SANTA CLARA COUNTY: A PLAN FOR CONSERVATION,
For primary bibliographic entry see Field 03D.
W73-14675

RIVERFRONT DEVELOPMENT PLAN, CONNECTICUT RIVER, SPRINGFIELD, MASSACHUSETTS.
Springfield Planning Dept., Mass.
For primary bibliographic entry see Field 03D.
W73-14676

RIVERBANKS IMPROVEMENT PROGRAM, (BROOME AND TIOGA COUNTIES, N.Y.).
Broome County Planning Dept., Binghamton, N.Y.; and Southern Tier East Regional Planning Board, Binghamton, N.Y.
For primary bibliographic entry see Field 03D.
W73-14678

HOWARD COUNTY, INDIANA: COMPREHENSIVE WATER AND SEWER PLAN.
Hamilton (Ernest R.) Associates, Inc., Indianapolis, Ind.
For primary bibliographic entry see Field 03D.
W73-14680

STUDY OF THE CINCINNATI RIVERFRONT - PART I: REGIONAL ASPECTS.
Cincinnati Planning Commission, Ohio.

October, 1969. 16 p, 2 fig, 5 tab, 16 append.

Descriptors: *Regional development, *Recreation demand, Rivers, Land use, Flood plains, Projections, *Ohio River.
Identifiers: *Riverfronts, *Regional economy, *Land use suitability, Waterborne commerce, *Cincinnati.

The Cincinnati regional riverfront is defined as a 45 mile reach of the Ohio River from Lawrenceburg, Indiana to New Richmond, Ohio. The study focuses on the economy of the area, where the population is expected to increase by 20% between 1960 and 1980; on waterborne commerce, with changing patterns in shipping reflected in fewer coal-coke terminals and more terminals devoted to oil-gasoline products, and chemicals; on industrial expansion devoted chiefly to power plants, iron and steel manufacture, atomic energy installations and gas and electric utilities; on land uses in riverfront area; and on the rapidly increasing demands for recreation. Much of the data presented is based on U. S. Army Corps of Engineers reports and previous Planning Commission studies. A key feature of the study is a land use suitability analysis in which various areas of the riverfront region are ranked on the basis of accessibility, flood plain levels, and relationships between land uses. Some basic conclusions are that the region will grow economically at a nominal rate until 1980, that there is a large amount of vacant land available but much of it is not suitable because of lack of access or potential flooding, and that recreation demands are becoming a significance force in the development of the region with needs for future harbor and launching facilities for pleasure craft becoming increasingly evident. (Elfers-North Carolina)
W73-14681

WATER AND WASTEWATER PLAN FOR ANDERSON, BLOUNT, AND KNOX COUNTIES, TENNESSEE - VOLUME I, WATER SUPPLY AND DISTRIBUTION.
Allen and Hoshall, Memphis, Tenn.
For primary bibliographic entry see Field 05G.
W73-14682

WATER AND WASTEWATER PLAN FOR ANDERSON, BLOUNT, AND KNOX COUNTIES, TENNESSEE - VOLUME II, WASTEWATER COLLECTION AND TREATMENT.
Allen and Hoshall, Memphis, Tenn.
For primary bibliographic entry see Field 05G.
W73-14683

THE URBAN RIVER: A STAFF PROPOSAL FOR WATERFRONT DEVELOPMENT IN THE DISTRICT OF COLUMBIA.
National Capital Planning Commission, Washington, D.C.
For primary bibliographic entry see Field 03D.
W73-14686

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A STUDY OF MANAGERIAL PRACTICES IN RURAL WATER SYSTEMS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 06B.
W73-14208

ELECTRICAL POWER CONSUMPTION FOR MUNICIPAL WASTEWATER TREATMENT,
National Environmental Research Center, Cincinnati, Ohio. Advance Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W73-14216

THE VALUE OF INFORMATION IN MAKING PUBLIC DECISIONS,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-14228

MATHEMATICAL SIMULATION OF AMMONIA STRIPPING TOWERS FOR WASTEWATER TREATMENT,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W73-14229

CONCEPTUAL DESIGN AND COST ESTIMATE 2.5 MGD DIRECT CONTACT CONDENSATION MULTISTAGE FLASH DESALINATION PLANT,
For primary bibliographic entry see Field 03A.
W73-14385

THE GRAND TRAVERSE BAY SPORT FISHERY: ANGLER ACTIVITY, REVENUE, AND ECONOMIC IMPACT,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 06B.
W73-14409

LAB AUTOMATION AT LOW COST,
Digital Equipment Corp., Maynard, Mass. Lab. Data Products Group.
For primary bibliographic entry see Field 07C.
W73-14451

EXTERNALITIES, FACTOR PROPORTIONS AND THE LEVEL OF EXPLOITATION OF FREE ACCESS RESOURCES,
London School of Economics and Political Science (England).
J. R. Gould.
Economica, Vol 39, No 156, p 383-402, 1972. 8 fig, 17 ref.

Descriptors: *Economic efficiency, *Resource allocation, Model studies, *Theoretical analysis, Industries, Welfare (Economics).
Identifiers: *Free-access resources, *Externalities, Factor proportions, Resource utilization.

The doctrine that free-access resources are over-exploited finds its theoretical foundation in the work of Pigou and Knight during the 1920's. Knight's analysis of the single variable factor is discussed and further elaborated in order to render the model logically consistent and easy to manipulate as well as to confirm Knight's doctrine that free-access resources are over-exploited. Next, the model is extended to include two variable factors making it necessary to consider the problem of efficient factor proportions. As a result of inefficient factor proportions the over-exploitation theorem is invalidated. Thus, free-access resources may be over- or under-exploited, and accordingly, increasing-cost industries may be over- or under-expanded. The case of increasing returns to variable factors, as analysed by Worcester, is compared with Knight's model. Worcester's assumption of indivisibility of the resource leads to a straightforward prescription of subsidy which does not follow from the assumption of divisibility as in the case of Knight's model. (Weaver-Wisconsin)
W73-14507

A NEW CONCEPT FOR OPERATOR WAGES,
Water Pollution Control Federation, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-14511

IMPLICATIONS OF PLLRC TAX RECOMMENDATIONS FOR FEDERAL HYDRO PROJECTS AND POWER FACILITIES,
Tennessee Valley Authority, Knoxville. Div. of Navigation Development and Regional Studies.
For primary bibliographic entry see Field 06E.
W73-14512

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: LEAD. PART I. INTRODUCTION AND EXECUTIVE SUMMARY.
Charles River Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W73-14516

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: LEAD. PART II. STRUCTURE OF THE INDUSTRY.
Charles River Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W73-14517

PRICETAG TO INDUSTRY,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 05D.
W73-14518

DESIGN FOR FUTURE PROGRAM CONSTRUCTION,
Washington State Dept. of Fisheries, Olympia. Engineering and Construction Div.
For primary bibliographic entry see Field 08I.
W73-14522

ECONOMIC ASPECTS OF SLOPING LAND DRAINAGE,
Agricultural Research Service, Burlington, Vt. Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W73-14523

WATER QUALITY AND CONSUMER COSTS.
Orange County Water District, Santa Ana, Calif.

May, 1972. 73 p, 13 fig, 17 tab, 24 ref.

Descriptors: *Water quality, *Water values, *Water utilization, *Data collections, Public benefits, Water users, California, Impaired water use, Potable water, Water distribution (Applied), Water supply, Water softening.
Identifiers: *Orange County (California).

Domestic water users were surveyed by the Orange County Water District and nine water purveying agencies in Orange County to determine the relationships between water quality and related consumer costs. Water quality varied from poor quality water from the Colorado River to high quality ground water. House values included in the survey ranged from below $20,000 to above $50,000. The survey was performed by personal interviews, with families picked from the telephone directory in 40 sampling areas. A total of 1,193 interviews were conducted in 16 cities. Questions were asked relative to: (1) the use of bottled water, (2) replacement of water heaters, (3) use of water softeners, (4) replacement of water piping, (5) occurrence of water damage in homes, (6) satisfaction with present water characteristics, and (7) willingness to pay for better water quality. These questions, and others, were correlated to water quality. Colorado River water, with a total dissolved solid (TDS) concentration of about 746 mg/l, imposes a cost of from $10 to $17 per household per month over expected State Water Project water which should have a TDS of 199 mg/l. (Poertner)
W73-14536

INVESTMENT CRITERIA AND MATHEMATICAL MODELLING TECHNIQUES FOR WATER RESOURCES PLANNING IN ARGENTINA: THE MIT-ARGENTINA PROJECT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-14670

CONSTRAINTS AND STRATEGIC CHOICES IN WATER SUPPLY INVESTMENT,
Wye Coll., Ashford (England). School of Rural Economics and Related Studies.
For primary bibliographic entry see Field 06A.
W73-14671

6D. Water Demand

SOCIOLOGICAL DIMENSIONS OF LEISURE INVOLVEMENT IN WATER-BASED RECREATION,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 06B.
W73-14211

FUTURE MUNICIPAL AND INDUSTRIAL WATER REQUIREMENTS IN THE QU'APPELLE RIVER BASIN.
Saskatchewan Water Resources Commission, Regina. Investigation and Planning Branch.

Qu'Appelle Basin Study, Item 230, April, 1972. 68 p, 1 fig, 53 tab, append.

Descriptors: *Water supply, *Water requirements, Withdrawal, Projections, Consumptive use, Municipal water, Industrial water, *Canada.
Identifiers: *Qu'Appelle River Basin, Regina, Moose Jaw, Melville, Saskatchewan.

Future water withdrawals in the Qu'Appelle River basin are expected to decrease significantly by the year 2000 because of the expected phasing out of the Regina power plant after 1985. Municipal water requirements are expected to rise during this period and account for 88.5% of the basin's withdrawals by 2000. Three cities in the basin, Regina, Moose Jaw, and Melville, will account for about 90% of the municipal requirements. Detailed water requirement data for these three cities and twenty-three towns, which are expected to grow, are presented in numerous tables. Water requirements are estimated for industries having their own water supplies. Municipal water supply requirements are estimated on the basis of population projections and an assumed increase of one gallon per capita per day for each year from 1970 to 2000. (Elfers-North Carolina)
W73-14231

WATER DISTRIBUTION AND WASTEWATER COLLECTION SYSTEMS IN FORSYTH COUNTY, NORTH CAROLINA WITH URBAN DEVELOPMENT FORECASTS: 1968-1978-2010.
City-County Planning Board, Winston-Salem, N.C.
For primary bibliographic entry see Field 05D.
W73-14233

AMARILLO, TEXAS: REPORT ON WATER DISTRIBUTION SYSTEM, 1967.
Freese, Nichols and Endress, Fort Worth, Tex.

January, 1968. 36 p, 6 fig, 4 plates, 13 tab, 3 append.

Descriptors: *Water distribution, *Distribution systems, Water requirements, Design criteria, Planning, Water supply, *Texas.
Identifiers: Capital improvements, Amarillo (Tex), Canadian River (Tex).

Specific water distribution requirements can be predicted with confidence for about five year periods. Thus, this engineering-oriented study is an extension or re-evaluation of a study conducted in 1962. The study includes an analysis of water demands and peak water use rates, a description of the existing distribution system, a presentation of engineering design criteria, an analysis of the capability of the existing system to meet future requirements, and a table of specific improvements for the five year period up to 1972. The report focuses on a detailed improvement program but it also serves as a general guide for water distribution planning to the year 1990. Among the long-range guidance issues discussed are the use of the Canadian River for a new source of water, the eventual use of groundwater, and the need for one or two new pressure zones as the metropolitan area expands. (Elfers-North Carolina)
W73-14243

WATER USE, CONSUMPTION, AND OUTLOOK IN THE U.S. IN 1970,
Geological Survey, Washington, D.C. Water Resources Div.
C. R. Murray.
Journal of the American Water Works Association, Vol 65, No 5, p 302-308, May 1973. 7 fig, 5 tab, 11 ref.

Descriptors: *Water utilization, *Water users, *Water consumption (Except consumptive use), *United States, Annual, Water supply, Water demand, Domestic water, Industrial water, Municipal water, Stock water, Irrigation, Surface waters, Groundwater, Water reuse, Water resources, Projections.

Every 5 years the U.S. Geological Survey does a study of water use in the United States. In this summary of the report for 1970, comparisons and estimates are made, and every major type of water use is investigated. Estimates of water withdrawals and water consumption in the US in 1970 include about 370,000 mgd or 1,800 gal per capita per day for uses other than the generation of hydroelectric power. About 87,000 mgd of the fresh water withdrawn was consumed; this amounted to about 420 gal per capita per day. About 2,800,000 mgd was withdrawn for hydroelectric power generation; this, like other withdrawal figures, is a cumulative figure because it includes water withdrawn from and returned to streams several times along their courses. Water used for hydroelectric-power generation is equivalent to 2-1/3 times the total runoff in the conterminous US. (See also W72-13829) (Knapp-USGS)
W73-14355

A COMPARISON OF URBAN WATER USE IN AUSTRALIA AND THE U.S.,
Swinburne Coll. of Tech., Hawthorn (Australia).
C. R. Weeks, and T. A. McMahon.
Journal of the American Water Works Association, Vol 65, No 4, p 232-237, April 1973. 2 fig, 3 tab, 6 photo, 26 ref.

Descriptors: *Water utilization, *Water demand, *Australia, Industrial water, Water measurement, *United States, Statistical methods, Correlation analysis, Cities, Urbanization.
Identifiers: Melbourne (Australia), Victoria (Australia).

A quantitative study to evaluate factors involved in residential and industrial water use in Australia was conducted. Levels and patterns of water use in Australia and the United States were compared. Data on Australian water use came from the major metropolitan areas, although specific residential water-use data came from three study areas in Victoria. All data on water use in the United States came from published reports. Some conclusions from the comparison were: present per capita water use in Australian cities is approximately 80% of the use in U.S. cities; overall per capita growth rate in water use is higher in Australian cities than in the U.S.; industrial water use in Melbourne per unit of production is generally lower than the corresponding U.S. figures; components of household use are similar in the two countries; household use of water in the Australian study-area is greater in unmetered and free water-supply areas than in metered areas (whereas in U.S. cities there appears to be no significant difference); and peak rates of demand in Victoria appear to be greater than in U.S. cities. Total demand by the year 2000 for Australian cities is estimated to be 150-190 USgped, which compares with the Water Resources Council figure of 170 USgped for the U.S. (Stein-North Carolina)
W73-14483

WATER RESOURCES OF MIDDLE GEORGIA.
Briley, Wild and Associates, Daytona Beach, Fla.

Available from the National Technical Information Service. Prepared for Middle Georgia Area Planning Commission, Macon. March 1972. 260 p, 33 tab, 23 plates, 4 append. MGAPC-71-08. CPA-GA-04-00-0164.

Descriptors: *Planning, *Water quality control, *Flood control, *Non-structural alternatives, Water supply, Storm runoff, Water resources, *Management, *Georgia.
Identifiers: Middle Georgia Area, Dual drainage system, Flood plain management.

A comprehensive and qualitative study of water supply, water quality control, storm drainage, flood control, and flood plain management for a seven county area around Macon, Georgia is presented. It is intended to define general relationships and offer broad alternatives rather than design specific projects. The report has four basic sections: (1) an inventory and analysis of the region's water resources including supply and demand estimates to 1990 when publicly owned water supplies are expected to be called upon to deliver about 50 mgd of water to domestic, industrial, and commercial users; (2) an outline of a water resources management program including principles for the allocation of surface water and groundwater resources and some policies on runoff related to water quality control; (3) a long range storm drainage and flood control plan that uses a dual drainage system concept whereby a man-made system handles small storms, and natural drainage ways are used for large storms; and (4) a flood plain management program including flood plain zoning, flood hazard identification, flood warning, subdivision regulations, and building codes. Non-structural rather than structural measures are emphasized. (Elfers-North Carolina)
W73-14499

FUTURE ALLOCATIONS OF LAND AND WATER: IMPLICATIONS FOR AGRICULTURAL AND WATER POLICIES,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
H. C. Madsen, E. O. Heady, K. J. Nicol, and S. H. Hargrove.
Journal of Soil and Water Conservation, Vol 28, No 2, p 52-60, 1973. 9 fig, 7 tab., 20 ref.

Descriptors: *Agriculture, *Institutional constraints, *Water demand, *Water allocation (Policy), *Pricing, Linear programming, Forecasting, Economic efficiency, Land development, Resources development, Water utilization, Competing uses, Crops, Livestock, Food abudance, Economics, Water requirements, Irrigation, Forages.
Identifiers: *Optimal food production, Policy recommendations.

A review of agricultural, land use, and water resources development policy clearly indicates a history of conflicting policy goals. If future food and fiber needs are to be met, the correct mix of policies for development and compensation must be established. A linear programming model was used to establish the possible outcomes during the year 2000, given a framework of selected sets of alternative assumptions concerning farm policy, population, water prices, exports, and technological change. The cost of meeting domestic and export demands for food and fiber was minimized subject to land and water resources. Three general results followed from the analysis: (1) Land should not become physically or economically scarce in 2000; (2) given a national objective of economically optimal food production and land and water use, Western drylands should increase; and (3) given this same economic objective, water would be in surplus supply in the West. Thus, water development for agriculture should be minimized and irrigation development halted if public cost for maintaining given national levels of farm prices and income is to be minimized. (Weaver-Wisconsin)
W73-14521

WATER QUALITY AND CONSUMER COSTS.
Orange County Water District, Santa Ana, Calif.
For primary bibliographic entry see Field 06C.
W73-14536

WATER SUPPLY PLAN (REVISED) FOR COLUMBUS-FRANKLIN COUNTY,
Mid-Ohio Regional Planning Commission, Columbus.
W. B. Habig, H. T. Merwin, R. B. Cooper, and K. A. Cristofani.
December, 1972. 33 p, 5 fig, 4 tab, 5 plates, 1 append. HUD-Ohio-P-307.

Descriptors: *Planning, *Water supply, *Water demand, *Water distribution, Environmental effects, Water sources, Groundwater, Reservoirs, *Ohio.
Identifiers: Columbus (Ohio), Franklin County (Ohio).

Revisions of the water supply plan element of the Adopted 1969 Water-Related Facilities Plan were necessary because of rapid urban growth and changing water demands, new state and federal legislation, and the increasing concern for environmental quality. The report focuses on new water demand projections up to year 2000, an analysis of possible sources of water supply including groundwater, on-stream reservoirs, and upground storage reservoirs, and update water distribution system plans. Recommendations for the future include the use of groundwater for the next increment of water supply, the study of environmental impacts of possible upground reservoirs, the consideration of wastewater recycling possibilities, the determination of the impact of potential large industrial water users, the implementation of an erosion control program to protect siltation of water supply reservoirs, and the formulation of a new long-range distribution system scheme. The basic theme is one of increasing the flexibility for future action. (Elfers-North Carolina)
W73-14679

6E. Water Law and Institutions

PRIVATE SECTOR REACTION TO NORMAL POLITICAL INSTITUTIONAL PROCEDURES AND OUTCOMES WHEN WATER IS AN ISSUE,
Clemson Univ., S.C. Dept. of Political Science.
H. E. Albert, and D. N. Hall.
Available from the National Technical Information Service as PB-223 375, $6.50 in paper copy, $1.45 in microfiche. Water Resources Research Institute, Clemson University, Clemson, S. C. Report No. 37, 1973. 279 p, 9 fig, 12 tab, 5 append. OWRR B-034-SC (6).

Descriptors: *South Carolina, Social aspects, Political aspects, Administration, *Water pollution, Economics, *Environmental effects, Coasts, *Institutions, *Federal government, *State governments.
Identifiers: Beaufort County (S.C.), Hilton Head Island (S. C.), Columbia (S.C.).

Files, public records and interviews were used to reconstruct a conflict which occurred in South Carolina in 1969 and 1970. The purpose was to establish points of contact between government and various parts of the private sector, determine intergovernmental and interagency relationships, discover the methods used by interest groups to obtain governmental support, and pinpoint possible breakdowns of communication between governmental agencies and between government and the private sector. The conflict centered in the coastal area of South Carolina and dealt with the plans of the Badische Anilin und Soda Fabrik (BASF) Corporation to locate a chemical plant at Victoria Bluff. The residents of nearby Hilton Head Island opposed the plant on the basis of probable pollution. Included in the Hilton Head population are numerous retired business and military leaders, who had both the time and skills necessary to mount a major interest group opposition movement. The opposition was both skillful and effective. BASF finally withdrew all plans for locating their plant in Beaufort County. State officials supported the industry and were unprepared for massive and effective opposition to their normal procedures. Much of their reactions, therefore, was uncoordinated and divisive in its effect. The opposition found its major support with the national government and this interjected elements of federalism.
W73-14210

PROCEEDINGS - SIXTEENTH ANNUAL WATER CONFERENCE.
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 04A
W73-14224

THE PLACE OF LOCAL AUTHORITIES IN THE MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES,
Manchester County Borough (England).
G. C. Ogden.
Effluent and Water Treatment Journal, Vol 11, No 11, p 607-611, November, 1971.

Descriptors: *Institutions, *Administrative agencies, *Governments, Water resources development, Management, Planning, Coordination.
Identifiers: *Water authorities (England).

Governmental organization for water resource planning and management in England is discussed. The Central Advisory Water Committee appointed to deal with this question recognized the need for national and regional coordination of water resource functions but could find no objective basis on which to recommend between central government-oriented regional water authorities and local government-oriented single purpose authorities. Although local authorities have been recently criticized, they have accomplished significant water resource programs and levels of service and are better than regional authorities in that they are more responsive to the social needs of the people, they have closer links to other planning authorities such as for housing, recreation, and health, and they would be more effective in terms of local coordination and implementation, particularly in resolving conflicts publically. In addition, the local authorities could have representatives on regional authorities for coordination at a broader scale and policy formulation. (Elfers-North Carolina)
W73-14230

GULL LAKE-WATER LEVEL STABILIZATION.
Red Deer Regional Planning Commission (Alberta).

October, 1968. 9 p, append.

Descriptors: Management, *Water sports, *Phreatophytes, *Water level fluctuations, Agriculture, Stabilization, Outdoor recreation, Land classification, *Canada.
Identifiers: *Gull Lake (Alberta).

This brief, requesting assistance under Part VIII Agriculture and Rural Development Act, proposes a project to stabilize water levels in Gull Lake by watershed management in the Gull Lake and Upper Lloyd Creek Basin involving improved land use and productivity by means of drainage, phreatophyte control and diversion. Decline in the Gull Lake water level and extension of marshy beach areas are noted, having detrimental effects on current and future recreational use of Gull Lake. Potential project benefits are ennumerated, including those both for agriculture and recreation, with the conclusion that the optimum value should be obtained from all resources within the area considered for action in this scheme. Proposed future investigation is outlined, accompanied by a cost sharing scheme for the project. Appended are maps of soil capability, oil and gas well locations, recreational capability, shoreland capability, and brief summaries of two preceding studies. (Edwards-North Carolina)
W73-14232

INTERNATIONAL CONFERENCE ON REMOTE SENSING IN ARID LANDS,
Arizona Regional Ecological Test Site, Tucson.
For primary bibliographic entry see Field 07C.
W73-14327

RESEARCH FOR APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENTS (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 07C
W73-14349

CANADA ANIMAL WASTE MANAGEMENT GUIDE.
Department of Agriculture, Ottawa (Ontario). Animal Waste Management Guide Committee
For primary bibliographic entry see Field 05G
W73-14392

CONCEPTUAL MODEL OF A REGIONAL WATER QUALITY AUTHORITY,
Harvard Univ., Cambridge, Mass
For primary bibliographic entry see Field 05G.
W73-14459

AN ILLUSTRATIVE MODEL OF RIVER BASIN POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass
For primary bibliographic entry see Field 05G.
W73-14460

FLOW REGULATION FOR WATER QUALITY MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
W73-14466

FLOOD INSURANCE: A REPORT ON ASSISTANCE TO FLOOD VICTIMS IN UNINCORPORATED LAKE COUNTY, ILLINOIS.
North Branch Chicago River Flood Control Steering Committee, Ill.
For primary bibliographic entry see Field 06F.
W73-14485

IMPLICATIONS OF PLLRC TAX RECOMMENDATIONS FOR FEDERAL HYDRO PROJECTS AND POWER FACILITIES,
Tennessee Valley Authority, Knoxville. Div. of Navigation Development and Regional Studies.
C. M. Stephenson.
Land Economics, Vol 49, No 1, p 67-75, 1973. 1 tab, 13 ref.

Descriptors: *Public lands, *Taxes, *Compensation, *Federal government, Multi-purpose projects, Powerplants, Income, Local governments, State governments, Federal project policy, Tennessee Valley Authority.
Identifiers: *In-lieu-tax payments, Revenue sharing.

The Public Land Law Review Commission (PLLRC) has developed recommendations with respect to the problem of revenue sharing and payments in lieu of taxes on federal property. These are evaluated in connection with six hydro and power projects in which payments to states and counties are currently made. The TVA payment accounted for 82% of all shared revenues and payments in lieu of taxes for all federal hydro and power projects in fiscal 1970. The remainder of the total $19.6 million was accounted for by the Army Corps of Engineers, Bureau of Reclamation, and the Federal Power Commission. The TVA payment increases steadily because it is based on growing power revenues. However, the Bureau of Reclamation and the Corps of Engineers multipurpose hydro projects base such payments neither on federal investment nor on power sales revenues. Federal payments in lieu of taxes as compared to estimated value of Federal property or revenue of multipurpose projects were found to be meager with the exception of the TVA. Given the PLLRC recommendations for a uniform policy

where payments would reflect a public benefits discount of 10-40% of revenue based on private ownership, the major problem is estimating the amount of potential payments to state and local governments. (Weaver-Wisconsin)
W73-14512

ONTARIO'S WATER TAKING PERMIT PROGRAM,
Ontario Ministry of the Environment, Toronto. Water Quantity Management Branch.
R. P. Dennis.
Water Resources Bulletin, Vol 9, No 1, p 41-48, 1973. 5 fig, 6 ref.

Descriptors: *Water allocation (Policy), *Water permits, *Equitable apportionment, Water supply, Legislation, Common law, Surface water, Groundwater, Water utilization, Wells, Preferences (Water rights), *Canada.
Identifiers: *Ontaria.

Permits issued by the Ontario Ministry of the Environment are required for most water takings in Ontario which are in excess of 10,000 gallons per day for purposes other than domestic, farm or fire fighting. The water-taking program provides protection and control beyond that under common law for situations ranging from water-supply interference between individuals to competing demands. Permits do not create water rights and require permittees to ensure that sufficient water is made available for the needs of prior users. The application of the permit program to an interdisciplinary water-management problem is illustrated by the case of the installation of two high-capacity municipal wells in the rural area of Hunsburger Creek basin to provide additional water for Kitchener, Ontario. Specific permit requirements were designed to protect existing well supplies, streamflow, pond levels and fish. An additional case study of potential conflict in uses of the Big Creek basin indicated that tobacco irrigation reduced stream-flow significantly and that detailed water-management plans for years of extreme irrigative demand should be developed. (Weaver-Wisconsin)
W73-14525

DECISION-MAKING IN WATER RESOURCE ALLOCATION,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06B.
W73-14609

REALITIES OF URBAN WATER RESOURCES OPERATING PERSPECTIVE,
Washington Suburban Sanitary Commission, Hyattsville, Md.
For primary bibliographic entry see Field 03D.
W73-14614

WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W73-14716

ENVIRONMENTAL IMPACT REQUIREMENTS IN THE STATES,
Center for California Public Affairs, Claremont.
For primary bibliographic entry see Field 05G.
W73-14749

6F. Nonstructural Alternatives

OPTIMIZATION OF WATER RESOURCE SYSTEMS INCORPORATING EARTHQUAKE RISK: 1973 CONTRIBUTIONS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 06A.
W73-14204

FLOOD PLAIN INFORMATION, CLARKSVILLE, TENNESSEE.
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 04A.
W73-14238

STATUS OF FLOOD-PLAIN MAPPING, GREATER PITTSBURGH REGION, PENNSYLVANIA, 1972,
Geological Survey, Carnegie, Pa.
For primary bibliographic entry see Field 07C.
W73-14352

FLOOD INSURANCE: A REPORT ON ASSISTANCE TO FLOOD VICTIMS IN UNINCORPORATED LAKE COUNTY, ILLINOIS.
North Branch Chicago River Flood Control Steering Committee, Ill.

Prepared for Lake County Board. November 1972. 6 p, 2 append.

Descriptors: *Flood plain insurance, Flood plain zoning, Flood plains, Coordination, Flood damage, Flood protection, *Illinois, Land use.
Identifiers: *Land use controls, *Flood plain management, *Federal Flood Insurance Program, *Lake County (Ill).

The North Branch Chicago River Flood Control Steering Committee was created in 1972 to study flood problems in Lake County and help propose flood relief measures. Their findings are presented on the federal Flood Insurance Program in relation to Lake County. The Flood Insurance Program enables property owners in flood prone areas to purchase flood insurance with the premiums subsidized up to 90% by the federal government. However, this program is only available if the local government in question qualifies via meeting certain federal requirements such as (1) preparing information and maps covering existing flood programs, (2) enacting minimum land use controls (e.g. building codes, zoning ordinances) in flood prone areas, (3) assuring that future flood plain management will be carried out, and (4) designating a local coordinator to be responsible for carrying out the federal Program. Lake County can meet the federal requirements. The creation of a Comprehensive Flood Programs Coordinating Committee is recommended. (Elfers-North Carolina)
W73-14485

FLOOD HAZARD STUDY.
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.

December 1971. 38 p, 6 fig, 1 tab, 1 append.

Descriptors: *Flood plain zoning, *Flood plain insurance, *Flood control, Planning, Non-structural alternatives, Drainage, *Georgia, Land use, *Regulation.
Identifiers: *Savannah (Chatham County).

The Chatham County-Savannah area is characterized by low coastal lands with many canals, rivers and waterways. Much of the area is vulnerable to flooding by extensive rainfall, tidal flooding, or a combination of both. Flooding incidents in 1964 and 1970 highlighted the fact that development has been allowed to take place in areas where physical protection from flooding is poor or entirely lacking. The objective of this study is to present regulations of land use within the flood damage prone zones that will aid in minimizing flood damage, while at the same time insuring the continuance of Federal Flood Insurance for Chatham County. Consequently, the recommendations presented adhere closely to federal guidelines. Primary preventive measure suggested is a Flood Plain District Ordinance, the content of which is explicitly stated. Other preventive measures, such as subdivision regulations, building codes, and other health regulations, are similarly stated in totum; while warning signs, development policies, open spaces and tax adjustments are only generally recommended as needing implementation. As part of a two-pronged approach to flood damage control, needed corrective measures as well as preventive measures are cited. Primarily, channel improvements, watershed treatment, water reservoirs, levees and walls are recommended. (Hoffman-North Carolina)
W73-14491

DES PLAINES RIVER VALLEY: GOALS, POLICIES, AND RECOMMENDATIONS.
Des Plaines River Valley Comprehensive Plan Steering Committee, Ill.

Prepared for Lake County Board of Supervisors, (1971). 4 p.

Descriptors: *Flood plains, *Planning, *Recreation, Water quality, Coordination, Small watersheds, Flood control, Urbanization, *Illinois.
Identifiers: *Flood plain management, Water resource policies, Lake County (Ill), Forest preserves, *Des Plaines River (Ill).

In July, 1970, the Des Plaines River Valley Comprehensive Plan Steering Committee was created by the Lake County Board of Supervisors to develop an overall plan for the river valley and to help coordinate policy formulation and plan implementation. The Des Plaines River which flows 35 miles through Lake County has a history of flooding, as its channel capacity is quite limited, and has recently been deteriorating in water quality. Goals and policies are being formulated in three broad areas of concern: flooding and water management; sanitation and water resources; and recreation and public relations. Some of these policies include the multiple uses of the Des Plaines River, the implementation of flood plain regulations, the acquisition of flood plain areas, the careful planning of large scale developments to control storm runoff, the adoption of Illinois EPA water quality standards and the development of the entire waterfront areas as part of the Lake County Forest Preserve system. Specific recommendations for action focus on acquiring flood plain areas with priority given to 'sites having geological, ecological or historic value, and sites which are being threatened by urbanization', developing the river as a 'water trail' for canoeing and fishing, controlling erosion and sedimentation by use of regulating weirs and dams on river and tributaries, control of storm water runoff, contour plowing of farm lands, and ground cover plantings, and allowing only low intensity urban development in the valley. (Elfers-North Carolina)
W73-14495

RIVERBANKS IMPROVEMENT PROGRAM, (BROOME AND TIOGA COUNTIES, N.Y.).
Broome County Planning Dept., Binghamton, N.Y.; and Southern Tier East Regional Planning Board, Binghamton, N.Y.
For primary bibliographic entry see Field 03D.
W73-14678

STUDY OF THE CINCINNATI RIVERFRONT - PART I: REGIONAL ASPECTS.
Cincinnati Planning Commission, Ohio.
For primary bibliographic entry see Field 06B.
W73-14681

THE URBAN RIVER: A STAFF PROPOSAL FOR WATERFRONT DEVELOPMENT IN THE DISTRICT OF COLUMBIA.
National Capital Planning Commission, Washington, D.C.
For primary bibliographic entry see Field 03D.
W73-14686

6G. Ecologic Impact of Water Development

SHORELINE ANALYSIS OF THE CITY OF SARASOTA.
Smally, Wellford and Nalven, Sarasota, Fla.
For primary bibliographic entry see Field 06B.
W73-14239

TRANSACTIONS OF THE 37TH NORTH AMERICAN WILDLIFE NATURAL RESOURCES CONFERENCE,

Meeting held in Mexico City, Mexico, March 12-15, 1972. Wildlife Management Institute: Washington, D.C., 1972. J. B. Trefethen, editor. 472 p, Illus, Maps. Paper. Pr. $6.50.
Identifiers: Birds, Books, *Conferences, Fishes, Human population, *Natural resources, Sea, Symposium, Transactions, Turtle, *Wildlife.

This book contains contributed papers presented at the conference on various aspects of wildlife conservation and management. Part 1 contains papers international conservation challenges, includes papers on renewable natural resources in Mexico; human population, food demands and wildlife needs; balancing human populations with life support systems; and need for a new North American wildlife policy. Part 2 contains technical sessions on natural resources, coastal and marine resources; new needs and views in resource planning; and water, fish, wildlife and society. Part 3 is composed of the reports of special panels involving the ceremony marking the amendment of the 1936 convention for the protection of migratory birds, and the implementation of the council of environmental quality. Finally, the closing general session includes papers on subjects involving soil erosion, chemical contamination of soil and water and recycling of solid wastes.--Copyright, Biological Abstracts, Inc.
W73-14526

07. RESOURCES DATA

7A. Network Design

MEASUREMENT OF FLOOD FLOW AND SUSPENDED SEDIMENTATION BY RADIOISOTOPE METHOD,
Taiwan Power Co., Taipei.
For primary bibliographic entry see Field 07B.
W73-14540

DECISIONS WITH INADEQUATE HYDROLOGIC DATA.
For primary bibliographic entry see Field 02A.
W73-14550

IMPROVEMENT OF HYDROLOGICAL SERVICES IN BOLIVIA,
World Meteorological Organization, La Paz (Bolivia).
L. E. Paredes-Arce, and W. Klohn.
In: Decisions with Inadequate Hydrologic Data; Proceedings of 2nd International Symposium in Hydrology, September 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 40-47, 1973. 1 fig, 8 ref.

Descriptors: *Data collections, *Network design, *Economics, *Cost-benefit analysis, Project planning, Decision making, Gages, Instrumentation, Hydrologic data, Water measurement, Stream gages, Rain gages, Precipitation gages.
Identifiers: *Inadequate hydrologic data, *Bolivia.

The Bolivian Government created a unified hydrological and meteorological service in 1968. Available national and international resources are not sufficient for implementation and operation of a minimum national hydrologic network according to the WMO network density criteria. Therefore, a pragmatic approach is required, following different policies in agreement with regional geographic reality. In the mountainous area, priority will be given to immediate and obvious project needs; these will not be satisfied by single stations in project sites, but by local networks. In the eastern plains of Bolivia, no real network is possible owing to geographic isolation, but reference stations will be installed as far as allowed by accessibility of sites and available facilities. Once installed, continued operation of stations will be emphasized. (See also W73-14550) (Knapp-USGS)
W73-14554

THE USE OF TRACER DATA IN INCREASING THE INFORMATION ON HYDROLOGIC SYSTEMS,
Weizmann Inst. of Science, Rehovot (Israel). Isotope Dept.
For primary bibliographic entry see Field 02A.
W73-14558

EXPERIENCE WITH A MONTHLY RAINFALL--RUNOFF TRANSFER FUNCTION MODEL,
Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 02A.
W73-14560

THE USE OF EVOP AS A HYDROLOGIC TOOL,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14561

A SIMULATION TECHNIQUE OF MONTHLY RUNOFF BY USE OF PRECIPITATION TIME SERIES AT MULTISTATIONS,
Hokkaido Univ., Sapporo (Japan). Dept of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14562

7B. Data Acquisition

AN ASSESSMENT OF AUTOMATIC SEWER FLOW SAMPLERS,
Hydrospace-Challenger, Inc., Rockville, Md.
For primary bibliographic entry see Field 05A.
W73-14221

VERSATILE COMBUSTION-AMALGAMATION TECHNIQUE FOR THE PHOTOMETRIC DETERMINATION OF MERCURY IN FISH AND ENVIRONMENTAL SAMPLES,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 05A.
W73-14271

THERMAL REMOTE SENSING ON THE MISSISSIPPI RIVER IN IOWA,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 05A.
W73-14286

PREPARATION AND PROPERTIES OF THE SULFATE ION SELECTIVE MEMBRANE ELECTRODE,
State Univ of New York, Buffalo Dept of Chemistry
For primary bibliographic entry see Field 02K
W73-14301

ESTIMATING PRECISION FOR THE METHOD OF STANDARD ADDITIONS,
Oregon State Univ., Corvallis
For primary bibliographic entry see Field 02K
W73-14305

SOME INSTRUMENTS AVAILABLE NOW FOR THE MEASUREMENT OF WASTEWATER PARAMETERS,
Ionics, Inc., Watertown, Mass. Instrument Div.
For primary bibliographic entry see Field 05A.
W73-14321

PRACTICAL EXPERIENCE OF THE WATER RESOURCES DIVISION IN THE USE OF MULTIPARAMETER ELECTRONIC RECORDERS AND AUTOMATED TECHNIQUES FOR MONITORING WATER QUALITY IN STREAMS,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 05A.
W73-14323

PROCEEDINGS OF THE THIRD ANNUAL CONFERENCE ON REMOTE SENSING IN ARID LANDS.
Arizona Univ., Tucson. Office of Arid Lands Studies.

Arizona University, Tucson, Office of Arid Lands Studies. November 1972. 379 p, 183 fig, 5 tab, 163 ref.

Descriptors: *Remote sensing, *Arid lands, *Land use, *Irrigation practices, *Terrain analysis, Surveys, Photogrammetry, Soil moisture, Soil-water-plant relationships, Natural resources, River basins, Flood forecasting, Wheat, Australia, California, Arizona, Data collections.

Of the 24 papers presented a number are addressed to the use of remote sensing in water-oriented problems: The NOAA/NESS program of remote sensing of soil moisture relates to the development of a satellite sensor to provide soil-moisture evaluation in large river basins in order to improve flood and water-level forecasts. Application of a directional reflectance model to wheat canopies under stress enables one to establish the expected consistency between the biological conditions and the remotely-sensed effect. The use of remote sensing techniques in the arid lands of Australia has been applied to land use potential, range-land studies, and mineral exploration and geology, a prime example of the number of operational applications to studies and inventories of an arid environment. Vegetation-terrain feature relationships in southeast Arizona may be determined on relatively small-scale imagery as a valuable indicator of vegetation distribution in an arid area. Monitoring the effects of a changing resource base in an arid lands area: The west side of the San Joaquin Valley, California, illustrates the use of remote sensing to determine land use changes in this arid region for the years 1957 and 1971, focusing on the nature, location, magnitude, direction, and rate of such changes. Remote sensing of irrigation techniques and crop patterns in the Douglas basin, Arizona, describes 7 test areas, irrigation methods used in each, and the crop type, showing conclusively that remote sensing is an effective method of determining the relationship of tail water runoff to various irrigation practices. (See W73-14327 thru W73-14350) (Paylore-Arizona)
W73-14326

INTERNATIONAL CONFERENCE ON REMOTE SENSING IN ARID LANDS,
Arizona Regional Ecological Test Site, Tucson.
For primary bibliographic entry see Field 07C.
W73-14327

ORBITAL AND AERIAL (RB-57) PHOTOGRAPHY FOR MAPPING SOILS AND GEOLOGY IN SEMI-ARID WEST TEXAS AND EASTERN NEW MEXICO,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 07C.
W73-14328

EVALUATION OF ERTS-1 IMAGERY FOR AN INVENTORY OF POST-1890 ACCELERATED EROSION,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 07C.
W73-14329

THE NOAA/NESS PROGRAM OF REMOTE SENSING OF SOIL MOISTURE,
National Environmental Satellite Service, Washington, D.C.
D. R. Wiesnet.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Land Studies, p 66-72, 1972. 3 fig, 6 ref.

Descriptors: *Remote sensing, *Microwaves, *Soil moisture, Aircraft, Satellites (Artificial), Arid lands, Deserts, Arizona, Radiation, Data collections.
Identifiers: *Microwave radiometry.

Radiation emitted in the microwave band of the electromagnetic spectrum by a wet soil is quite different from that emitted by a dry soil. Considerably less energy is detected from the wet soils, and emissivity also varies with the wavelength. A 13.4 GHz radiometer detects radiation emitted from a depth of 5 cm in dry soil. By using lower frequencies, it is possible to sense radiation that is deeper in the soil. (See also W73-14326) (Knapp-USGS)
W73-14330

METALLOGENIC SIGNIFICANCE OF ALASKAN GEOSTRUCTURES SEEN ON NIMBUS AND ERTS IMAGES,
For primary bibliographic entry see Field 07C.
W73-14331

BASIC CONSIDERATIONS OF HIGH RESOLUTION SIDE-LOOKING RADAR IMAGERY,
Goodyear Aerospace Corp., Litchfield Park, Ariz. Sensor Applications Engineering.
E. S. Leonardo.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 78-103, 1972. 19 fig.

Descriptors: *Remote sensing, *Radar, *Aircraft, *Topographic mapping, Terrain analysis, Data collections, Forests, Geology, Land use.
Identifiers: *Side-looking radar.

High resolution side-looking radar is an active sensor capable of day or night operation and, depending on wavelength, unaffected by weather conditions. The end product is an image that can be interpreted and analyzed by geologists, foresters, cartographers and other earth scientists. High resolution side-looking radars direct a narrow beam of energy at right angles to the flightpath. A pulse of radar energy is transmitted from the radar antenna, and the relative intensity of the reflections is used to produce an image of a narrow strip of terrain. The wavelength of energy used in high resolution radars varies from about 1 cm to 3 cm. (See also W73-14326) (Knapp-USGS)
W73-14332

THE APPLICATION OF RADAR AND INFRARED IMAGERY TO QUANTITATIVE GEOMORPHOLOGICAL PROBLEMS,
Texas Univ., Austin. Bureau of Economic Geology.
P. J. Cannon.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 104-123, 1972. 12 fig, 5 ref.

Descriptors: *Remote sensing, *Radar, *Infrared radiation, *Small watersheds, Mapping, Geologic mapping, Terrain analysis, Data collections, Vegetation, Drainage patterns (Geologic).

A detailed quantitative geomorphic investigation of an area can be supported by radar and infrared imagery. The Mill Creek drainage basin in south-central Oklahoma was selected as the area for study because of the availability of the data. The usefulness of radar imagery as a quantitative geomorphic tool depends on the size of the area to be investigated, the relief, and the distribution of vegetation. Infrared imagery can provide geomorphic information comparable in amount and quality to information taken from some photographic and topographic studies. Radar and infrared imagery can be used in conjunction to counteract their shortcomings, providing a new and valuable tool to the quantitative geomorphologic investigations of drainage basins. Regional evaluations of drainage basins can be made with radar imagery, and infrared imagery can provide special data about small component basins and portions of basins. (See also W73-14326) (Knapp-USGS)
W73-14333

APPLICATION OF A DIRECTIONAL REFLECTANCE MODEL TO WHEAT CANOPIES UNDER STRESS,
Michigan State Univ., East Lansing. Dept. of Botany.
G. R. Safir, G. H. Suits, and M. V. Wiese.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 124-135, 1972. 6 fig, 8 ref.

Descriptors: *Remote sensing, *Infrared radiation, *Moisture stress, *Wheat, Surveys, Data collections, Mathematical models.

A mathematical model was used to predict the directional reflectance of two wheat canopies under disease stress by wheat spindle streak mosaic virus and of the same two canopies under mild water stress. The model enables the directional reflectance of a given crop canopy to be traced to causative factors which are both geometrical and spectral in nature. Field measurements were made of the spectral reflectance of healthy wheat at two angles of view and at two stages of growth. The measured reflectances, in the spectral range of 0.5 to 1.3 micrometers, agreed well with values predicted by the model, indicating that the major components of a wheat canopy that contribute to its directional reflectance can be identified and analyzed. Using the model, it is possible to provide insights as to which detection techniques are most likely to be successful for the detection of wheat and wheat stresses. (See also W73-14326) (Knapp-USGS)
W73-14334

THE USE OF REMOTE SENSING TECHNIQUES IN THE ARID LANDS OF AUSTRALIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
R. R. Thaman, and D. A. Cottrell.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 136-151, 1972. 85 ref.

Descriptors: *Remote sensing, *Australia, *Aerial photography, Surveys, Land use, Arid lands, Data collections, Hydrology, Vegetation, Exploration, Geologic mapping, Grazing, Ecology.

A study of the use of remote sensing techniques in arid Australia is of considerable interest for a number of reasons: (1) the extensive and isolated nature of the area makes it particularly suitable for surveys using remote techniques; (2) historically, some of the first operational surveys using remote sensing techniques on a regional basis were carried out in this area; (3) considerable research has been conducted by a number of Commonwealth, State and Territorial agencies, private companies, and educational institutions in the use of remote sensing techniques; and (4) the benefits of the use of remote sensing techniques in the arid environment are of considerable economic value to Australia. (See also W73-14326) (Knapp-USGS)
W73-14335

VEGETATION-TERRAIN FEATURE RELATIONSHIPS IN SOUTHEAST ARIZONA,
Oregon State Univ., Corvallis. Rangeland Resources Program.
D. A. Movat.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 152-166, 1972. 8 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Terrain analysis, *Vegetation, *Arizona, Geomorphology, Topography, Data collections.
Identifiers: *ERTS.

ERTS-1 imagery is the first stage of a multistage sampling technique, the purpose of which is to determine the types and amounts of vegetation of sourthern Arizona. A comparison is being made of the facility with which landform identifications can be made using low sun angle monoscopic versus high sun angle stereoscopic techniques. There are positive relationships between certain plant species and certain terrain features. Not all species exhibit positive relationships with all terrain feature variables, but such studies have a definite place in plant ecological investigations. The vegetation groups examined appeared to be successfully discriminated by the terrain feature variables. Terrain features mirror factors which directly influence vegetational response and hence distribution. As a result, those environmental features which can be readily and rapidly ascertained on relatively small-scale imagery may prove to be valuable indicators of vegetation distribution. (See also W73-14326) (Knapp-USGS)
W73-14336

COMPARATIVE EVALUATION OF THERMAL PROFILE DATA OF HEALTHY AND INFESTED ENGLEMANN SPRUCE,
Forest Service (USDA), Phoenix, Ariz. Bureau of Pest Control.
D. D. Lucht, C. H. Denny, E. L. Morrison, Jr., and C. D. Worthman.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 168-187, 1972. 9 fig, 4 ref.

Descriptors: *Remote sensing, *Infrared radiation, *Forestry, Insects, Plant pathology, Plant diseases, Forests, Data collections.
Identifiers: *Engelmann Spruce trees, *Spruce beetles.

An infrared scanner was used to collect thermal ground-truth data in coniferous forest areas. This study contributes to the knowledge necessary to

utilize high altitude thermal scanner data for the previsual detection of spruce beetle investigation in the Engelmann Spruce Forest. The temperature profile of infested trees is closer to ambient air temperature than the temperature profile of healthy trees. Infested trees tend to be warmer than healthy trees during hot weather, and colder during extremely cold weather. (See also W73-14326) (Knapp-USGS)
W73-14337

MULTISPECTRAL REMOTE SENSED IMAGE ANALYSIS BY A SPECIAL ELECTRONIC SYSTEM,
Stanford Research Inst., Menlo Park, Calif.
J. A. Eikelman, Jr.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Land Studies, p 188-205, 1972. 8 fig, 1 tab.

Descriptors: *Remote sensing, *Satellites (Artificial), *Data processing, Clouds, Meteorology, Digital computers, Photography, Data collections.
Identifiers: *Time-lapse photography.

A very important technique that has been applied in studying dynamics and development of clouds is the generation of time-lapse sequences of cloud photographs. This has been particularly true with the data from the applied Technology Satellites that, under normal operations, take a picture every 23 minutes during daylight hours. An electronic system was designed for processing and analyzing satellite and other forms of remotely sensed imagery. The system provides a number of processing-analysis features, including a time-lapse sequence production capability. The system also provides many procedures that are not so easily obtainable by photographic or other techniques. These include variable magnification, image planning, selective image recall, frame-to-frame comparison or change detection, data intermixing, spectral (brightness) analysis, areal and distance measurements, and time-lapse sequencing. These features make this electronic system uniquely attractive for real-time operational applications. (See also W73-14326) (Knapp-USGS)
W73-14338

PRODUCTION OF THEMATIC MAPS BY OPTICAL ANALOG PROCESSING OF COLOR TRANSPARENCIES,
Arizona Univ., Tuscon. Optical Sciences Center.
F. V. Richard, and W. Swindell.
In: Processing of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 206-215, 1972. 10 fig.

Descriptors: *Remote sensing, *Mapping, *Aerial photography, *Data processing, Data collections, Analog computers.
Identifiers: *Thematic maps.

The analog scanning technique for the production of thematic maps from color transparencies is a relatively simple technique which offers the advantages of rapid processing, good spectral sensitivity and, at the same time, relatively low cost. The processed version of the transparency is recorded line by line as the original is being scanned. This real time feature of the analog approach allows for rapid processing. (See also W73-14326) (Knapp-USGS)
W73-14339

A COMPUTER PROGRAM FOR GENERATING SCATTERGRAMS ON THE CALCOMP PLOTTER,
Arizona Univ., Tucson. Dept. of Geography and Area Development.
For primary bibliographic entry see Field 07C.
W73-14340

REMOTE ANALYSIS OF AIRBORNE PARTICLES BY POLARIMETRY,
Arizona Univ., Tucson. Lunar and Planetary Lab.
D. L. Coffeen.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands, Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 232-243, 1972. 13 fig, 8 ref

Descriptors: *Remote sensing, *Optical properties, *Air pollution, Pollutant identification, Light quality, Aerosols, Particle size, Particle shape, Data collections.
Identifiers: *Polarimetry, Polarization (Light).

Particles suspended in the atmosphere can be studied by passive measurement of scattered sunlight in the useful wavelength range 0.3-3.5 micrometers. For a given wavelength, time, and direction, four independent parameters are necessary and sufficient to characterize a scattered light beam: intensity, percentage linear polarization and its position angle, and percentage circular polarization. The linear polarization is especially useful in deducing intrinsic properties of particles (size, shape, refractive index) and clouds of particles (cloud height, cloud optical thickness). Particulate air pollution can sometimes be detected, and the particles analyzed, by polarization techniques. (See also W73-14326) (Knapp-USGS)
W73-14341

THE APPLICATION OF SPACE IMAGERY TO ANTHROPOLOGY,
New Mexico Archeological Center.
T. R. Lyons, M. Inglis, and R. K. Hitchcock.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 244-265, 1972. 14 fig, 10 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Archeology, Land use, Cities, Urbanization, Surveys, Mapping, Data collections, Terrain analysis.
Identifiers: *Anthropology.

Remote sensing may be used in anthropology, archeology, and in ethnology. Gemine and Apollo imagery have, since the return of the first film to earth, served the earth sciences and pointed the way to more sophisticated data gathering, data handling, and data analysis systems. These systems are clearly applicable to the study of man and his environment in the analysis of patterns of human modification of the environment, of change in land use and settlement, and of the influence of physiography on man's activities. These analyses combined with the situation logic inherent in the synoptic view of a study area are all benefits now available to the anthropologist. (See also W73-14326) (Knapp-USGS)
W73-14342

THE KIN BINEOLA IRRIGATION STUDY: AN EXPERIMENT IN THE USE OF AERIAL REMOTE SENSING TECHNIQUES IN ARCHAEOLOGY,
New Mexico Archeological Center.
T. R. Lyons, B. G. Pouls, and R. K Hitchcock.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Land Studies, p 266-283, 1972. 6 fig, 19 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Archeology, *Irrigation, Land use, Cities, Urbanization, Surveys, Mapping, Data collections, Terrain analysis.
Identifiers: *Anthropology, *Kin Bineola (N Mex).

Analysis of a prehistoric irrigation system at Kin Bineola, near Chaco Canyon, northwestern New Mexico, was undertaken with the use of conventional black-and-white aerial photographs and a Kelsh plotter for microtopographic mapping. The purpose of this experiment was (1) to determine the effectiveness of photogrammetric procedures in identifying cultural features in an arid area of extremely low relief, (2) to aid in the interpretation and analysis of any identifiable features, and (3) to determine the value of these techniques in helping to plan research strategy. A number of cultural features were identified and mapped, including canals, diversion dams, and habitation sites. The photogrammetric procedures employed are explained in some detail, and the application of these techniques to this archeological problem is demonstrated. (See also W73-14326) (Knapp-USGS)
W73-14343

AN INTERDISCIPLINARY EVALUATION OF ERTS POTENTIAL FOR ARID REGIONS,
Nevada Univ., Reno. Renewable Resources Center.
For primary bibliographic entry see Field 07C.
W73-14344

MONITORING THE EFFECTS OF A CHANGING RESOURCE BASE IN AN ARID LANDS AREA: THE WEST SIDE OF THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
J. E. Estes, L. W. Senger, and R. R. Thaman.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Land Studies, p 308-317, 1972. 2 fig, 2 tab, 5 ref. NASA Grant 05-003-404.

Descriptors: *Remote sensing, *Aerial photography, *Satellites (Artificial), *Land use, California, Cities, Irrigation, Oil fields, Urbanization, Grazing, Surveys, Data collections.
Identifiers: *ERTS.

The west side of the San Joaquin Valley, an arid region, is undergoing intensive agricultural development and changes in existing extensive land-use patterns. Land-use changes were studied from high altitude photography and ERTS-1 data. An overall regional change pattern shows changes from an oil-producing and grazing area into a cropping region. ERTS-1 data, acquired over shorter intervals of time, should provide more information on: nature of change; location of change; magnitude of change; direction of change; and rate of change. (See also W73-14326) (Knapp-USGS)
W73-14345

GEOGRAPHIC INVESTIGATIONS ASSOCIATED WITH THE EROS PROGRAM OF THE DEPARTMENT OF THE INTERIOR,
Geological Survey, Washington, D.C. Geographic Applications Program.
J. L. Place.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 318-327, 1972. 5 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Land use, Cities, Urbanization, Data collections.
Identifiers: *ERTS, *U.S. Geological Survey.

The Geographic Applications Program of the USGS is evaluating the utility of satellite images, supplemented by high altitude aerial photographs, for studying the changing patterns of man's activities on the earth's surface. This would include such things as land use, population changes, or air and water pollution. Urban mapping is being done at a scale of 1:100,000. Among the 26 cities studied are Phoenix and Tucson. In all approaches to land use monitoring, a computerized information system is being developed to relate land use to a

variety of environmental or socioeconomic factors. A land use classification system is applicable in all 50 states, based upon primary use of high-altitude aerial photography or satellite imagery as major sources of information. (See also W73-14326) (Knapp-USGS)
W73-14346

AUTOMATED PLOTTING AND UPDATE OF LAND USE MAPS AND RELATED INFORMATION IN SOUTH CENTRAL ARIZONA,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 07C.
W73-14347

PROGRESS ON GEOLOGIC-TERRAIN MAPPING FOR LAND-USE PLANNING IN THE TUCSON AREA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-14348

RESEARCH FOR APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENTS (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 07C.
W73-14349

REMOTE SENSING OF IRRIGATION TECHNIQUES AND CROP PATTERNS IN THE DOUGLAS BASIN, ARIZONA,
J. Altenstadter, and K. Foster.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 374-379, 1972. 1 tab.

Descriptors: *Remote sensing, *Land use, *Crops, Irrigation, Return flow, Farms, Vegetation, *Arizona.
Identifiers: *Douglas basin (Ariz).

A joint study between the Office of Arid Lands Studies, University of Arizona, the Cochise County Planning Department, and the Whitewater Draw Natural Resource Conservation District investigation had three objectives: (1) to determine remote sensing responses of various irrigation techniques in the Douglas Basin that potentially contribute to the tail-water runoff problem; (2) attempt to discriminate four major crop types; and (3) determine the amount of land that has been set aside as fallow, idle, or retired from agricultural production. A multistage sensing design consists of (1) ground truth; (2) medium altitude (10,000 ft) thermal imagery and color infrared photography; and (3) ERTS-1 satellite imagery. Seven target areas were chosen in the area as a basis from which detailed runoff monitoring and crop type discrimination could be expanded to other areas. Fallow or idle fields could be delineated best, with orchards next. Alfalfa was correctly discriminated 72% of the time. Cotton and small grain proved the most difficult to discriminate using the color infrared photography. (See also W73-14326) (Knapp-USGS)
W73-14350

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Arlington, Va.
E. J. Pluhowski.
Available from NTIS, Springfield, Va 22151 as E-73-10316 Price $3.00 printed copy; $1.45 microfiche. Contract report for Goddard Space Flight Center, January 1, 1973. 6 p.

Descriptors: *Remote sensing, *Satellites (Artificial), *Turbidity, *Lake Ontario, Suspended load, Data collections, Surveys, Mapping, Path of pollutants.
Identifiers: *ERTS, Welland Canal, Niagara River, Oswego River.

The suspended sediment plumes generated by the Welland Canal and the Genesee River are identifiable in most band 5 frames received from ERTS-1. In descending order of value for plume detection in Lake Ontario are bands 4, 6, and 7. Little or no information content relative to plume detection is available in band 7. The Oswego River plume was not visible during low flow periods; however, it was identifiable immediately following storms. Increased suspended sediment loading emanating from storm runoff increases turbidity levels to the point where the plume becomes visible in the ERTS imagery. Despite the fact that it is detectable from high-altitude (60,000 ft) photography, the Niagara River plume was not visible in any of the ERTS-1 frames. Numerous examples of shoreline erosion were evident in the December 7, 1972, imagery of western Lake Ontario. Near-shore lake circulation patterns are usually apparent whenever turbidity plumes are sensed by the satellite. (Knapp-USGS)
W73-14354

DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
C. C. Reeves, Jr.
Available from NTIS, Springfield, Va 22151 as E73-10455 Price $3.00 printed copy; $1.45 microfiche. NASA contract report for Goddard Space Flight Center, March 31, 1973. 9 p, 3 fig.

Descriptors: *Water balance, *Ecosystems, *Limnology, *Texas, *New Mexico, Playas, Lakes, Lake morphology, Remote sensing, Aerial photography, Satellites (Artificial), Data collections, Computer programs, Data processing, Correlation analysis, Photography, Water level fluctuations.

The objective of this project is to correlate ERTS-1 satellite imagery signatures with the water balance ecosystem and geology-morphology of select lake basins in west Texas. Optical analysis of MSS imagery shows that water fluctuations in large lake basins, such as the Double Lakes site, can be monitored. Also, satellite imagery can be utilized to give a wet census of the number of small lake basins which contain water on any one pass. This becomes advisable, from a time and monetary standpoint, where areas, such as the Southern High Plains, contain tens of thousands of lake basins. Individual storm paths can also be traced. A wet census can also be taken from CCT data, but ground-truth correlation must be conducted in order to determine the number of computer classifications to utilize for differentiation of water from wet muds. (Woodard-USGS)
W73-14356

REMOTE SENSING OF WATER QUALITY: A STATE OF THE ART REPORT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 05A.
W73-14363

STRIP-MINED WATERSHED HYDROLOGIC DATA ACQUISITION STUDY,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
B. A. Tschantz.
Available from the National Technical Information Service as PB-223 558, $2.75 in paper copy, $1.45 in microfiche. Water Resources Research Center, University of Tennessee, Knoxville, Research Report No. 35, 1973. 17 p, 13 fig, 6 ref. OWRR A-030-TENN (1). 14-31-0001-3843.

Descriptors: *Remote sensing, *Strip mines, *Aerial photography, Hydrologic data, *Tennessee, Mapping, Infrared radiation, Land use, Watersheds (Basins), Data collections.
Identifiers: *Data acquisition.

Remotely-sensed aerial photography of two small strip-mined East Tennessee watersheds was used as a means for obtaining land-use information essential to econometric and hydrologic studies and for reclamation practice surveillance. 1:12,000 scale maps were produced for both watersheds from three color IR photographic flights. Other available high altitude photography and thermal imagery data were used to help map strip-mine disturbed areas. Excellent photographic coverage and quality permitted approximately 5,041 acres of watershed, representing 847 acres of distrubed bench, slope, and slide areas to be mapped for each mission at a cost of less than 10 cents/acre. The study demonstrated the usefulness of using low altitude IR photography for identifying, mapping, and measuring strip-mine disturbance areas.
W73-14368

OPTIMAL IDENTIFICATION OF AQUIFER PARAMETERS IN A DISTRIBUTE SYSTEM,
California Univ., Los Angeles. Dept. of Engineering.
For primary bibliographic entry see Field 02F.
W73-14375

IDENTIFICATION OF PARAMETERS IN FINITE LEAKY AQUIFER SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 02F.
W73-14376

GUIDE TO OPERATION AND MAINTENANCE OF THE AUTOMATIC PARTICLE SIZE ANALYZER,
Rocketdyne, Canoga Park, Calif.
For primary bibliographic entry see Field 03A.
W73-14380

THE APPLICATION OF GAS CHROMATOGRAPHY OF VOLATILE METAL CHELATES TO WATER ANALYSIS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 02K.
W73-14393

ARCTIC SEA ICE RIDGE FREQUENCY DISTRIBUTIONS DERIVED FROM LASER PROFILES,
Naval Oceanographic Office, Washington, D.C. Polar Oceanography Div.
For primary bibliographic entry see Field 02C.
W73-14408

DIRECT VAPORIZATION AND QUANTIFICATION OF ARSENIC FROM SOILS AND WATER,
Texas A and M Univ., College Station. Dept. of Agricultural Analytical Services; and Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 05A.
W73-14416

RESPONSE OF SALINITY SENSORS TO RAPIDLY CHANGING SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W73-14417

A COMPARISON BETWEEN MERCURY INJECTION AND NITROGEN SORPTION AS METHODS OF DETERMINING PORE SIZE DISTRIBUTIONS,
Western Australia Univ., Nedlands. Dept. of Soil Science and Plant Nutrition.
For primary bibliographic entry see Field 02G.
W73-14418

COINCIDENCE AND INTERFERENCE CORRECTIONS FOR DUAL-ENERGY GAMMA RAY MEASUREMENTS OF SOIL DENSITY AND WATER CONTENT,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-14424

NEW METHOD FOR EVALUATION OF DISSOLVED OXYGEN PROBE RESPONSE FOR K SUB L A DETERMINATION,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 05A.
W73-14452

A PHOTON COUNTING DEVICE FOR THE MEASUREMENT OF NANOSECOND AND MICROSECOND KINETICS OF LIGHT EMISSION FROM BIOLOGICAL SYSTEMS,
MSU-AEC Plant Research Lab., East Lansing, Mich.
For primary bibliographic entry see Field 05A.
W73-14453

MATHEMATICAL ANALYSIS OF A HEAT EXCHANGE THAT CAN BE CONTROLLED BY COMPUTER (ANALYSE MATHEMATIQUE D'UN ECHANGEUR DE CHALEUR QUI CONVIENT AU CONTROLE PAR ORDINATEUR),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 02C.
W73-14470

MEASUREMENT OF FLOOD FLOW AND SUSPENDED SEDIMENTATION BY RADIOISOTOPE METHOD,
Taiwan Power Co., Taipei.
D. S. L. Chu, C. F. Pan, and I. L. Cheng.
Final Report November, 1972. 36 p, 10 fig, 11 tab, 2 appendices. IAEA No. 644/RB.

Descriptors: *Flood flow, *Flow measurement, *Suspended solids, *Instrumentation, On-site tests, Analytic techniques, Sampling, Radioisotopes, Sedimentation, Sediment transport, Flow rates, Flood peak, Flood data, Flood discharge, Current meters.
Identifiers: *Taiwan.

The use of radioisotopes to measure flood flow and suspended sediment was studied in Taiwan. Flood flows were studied by comparison of results of the measurement of flows using tritium, the bromide isotope method, the chromium isotope EDTA method, and by the current-meter method. The use of tritium was found to be an acceptable method for flow measurement, but the low cost of the current meter method makes this method the most preferable. The use of tritium was found to be most effective for a mixing length, in meters, equal to 200 times Q 2/3, where Q is the river flow in cubic meters per second. A dosage of one curie per 20cubic meters per second of flow was found to be best. Suspended solids is an important factor in Taiwan water management, because rainfall is heavy (about 250 cm a year) and erosion occurs easily due to weak geological formations. Various sediment gauges have been tried, but they are difficult to operate under the Taiwan conditions. The radioisotope gauge proved to be of no advantage, although improvements in sensitivity and stability may make it usable. (Poertner)
W73-14540

METHOD OF RANDOMLY DISTRIBUTING GRAINS FOR MICROSCOPIC EXAMINATION,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.
W73-14574

INEXPENSIVE DUAL BEAM TURBIDIMETER,
Rochester Univ., N.Y. Inst. of Optics
For primary bibliographic entry see Field 02J
W73-14575

THE CIRCULATION OF PRINCE WILLIAM SOUND,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02L.
W73-14588

ESTUARINE AND COASTAL WATER DYNAMICS CONTROLLING SEDIMENT MOVEMENT AND PLUME DEVELOPMENT IN LONG ISLAND SOUND,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 02L.
W73-14590

NEW METHOD OF FORECASTING MUDFLOWS FROM THUNDERSTORMS (NOVYY METOD PROGNOZIROVANIYA SELEVYKH POTOKOV PO GROZAM),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02J.
W73-14599

TIME SENSING AND ANALYSIS OF COASTAL WATERS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02L.
W73-14631

EXPERIMENTAL STUDY OF WATERFLOOD TRACERS,
Jersey Production Research Co., Tulsa, Okla.
For primary bibliographic entry see Field 02E.
W73-14727

A CIRCUIT FOR A SELF-TIMING STOMATAL DIFFUSION POROMETER,
New South Wales Inst. of Technology, Sydney (Australia). School of Life Sciences.
For primary bibliographic entry see Field 02I.
W73-14747

7C. Evaluation, Processing and Publication

MATHEMATICAL SIMULATION OF AMMONIA STRIPPING TOWERS FOR WASTEWATER TREATMENT,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W73-14229

MACHINE-PLOTTED PROBABILITY CHARTS,
Sandia Lab., Albuquerque, N.M.
H. E. Anderson.
Journal of Quality Technology, Vol 5, No 3, p 135-137, July 1973. 1 fig, 1 tab, 4 ref.

Descriptors: *Data processing, *Computer programs, *Probability, Statistical methods.
Identifiers: Plotting.

A computer program is presented which can plot comulative probability charts. The program assumes that the mean and standard deviation have been calculated and that the sample data have been arranged in ascending order. The maximum sample size is 1000 with the program as presently written. (Little-Battelle)
W73-14282

THERMAL REMOTE SENSING ON THE MISSISSIPPI RIVER IN IOWA,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 05A
W73-14286

INTERNATIONAL CONFERENCE ON REMOTE SENSING IN ARID LANDS,
Arizona Regional Ecological Test Site, Tucson
L. K. Lepley
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972. Arizona University Office of Arid Lands Studies, p 1-11, 1972. 1 fig.

Descriptors: *Remote sensing, *Arizona, *Arid lands, Land use, Satellites (Articifical), Geologic mapping, Exploration, Mapping, Urbanization, Vegetation, Phreatophytes, Data collections, Erosion, Grazing, Oceanography, Farms, Snow cover, Ecology.
Identifiers: *Arizona Regional Ecological Test Site.

The Arizona Regional Ecological Test Site (ARETS) was created in late 1970 by the Department of Interior's EROS program and the University of Arizona at the request of the NASA. The purpose of its formation was to establish a center which would include a remote sensing data library, then facilities and equipment for analysis of the data, and a staff who could probide remote sensing expertise. Equipment available for use includes a video density analyzer to convert photographic density levels into contoured density steps and to automatically measure areas. The multispectral viewer combines black and white photography to produce color or false-color images. (See also W73-14326) (Knapp-USGS)
W73-14327

ORBITAL AND AERIAL (RB-57) PHOTOGRAPHY FOR MAPPING SOILS AND GEOLOGY IN SEMI-ARID WEST TEXAS AND EASTERN NEW MEXICO,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
B. L. Allen.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 12-45, 1972. 22 fig, 6 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Arid lands, Texas, New Mexico, Geologic mapping, Mapping, Surveys, Palyas, Data collections, Aerial photography.
Identifiers: *ERTS.

Apollo 9 orbital photography and RB-57 overflight photography were used to map soils and geologic features in the west Texas-eastern New Mexico area. The RB-57 overflights were useful for distinguishing areas of brown, gray, red, black, and white soils and revealed several alignments of playa lake basins. Apollo photography was particularly useful for gross geologic relationships such as lineament studies, highly generalized soil mapping, and regional distribution of cultural patterns. Previously undiscerned features on both types of photography could be mapped if the photos were compared to soil surveys and geologic maps of the area. Preliminary examination of ERTS-1 MSS imagery indicates that resolution and definition is adequate for general soils maps and regional geologic studies. Identifiable resolution for high contrast linear objects is on the order of a foot. (See also W73-14326) (Knapp-USGS)
W73-14328

EVALUATION OF ERTS-1 IMAGERY FOR AN INVENTORY OF POST-1890 ACCELERATED EROSION,
Geological Survey, Tucson, Ariz.
R. B. Morrison.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 46-65, 1972. 14 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Erosion, *Arid lands, Grasslands, Mapping, Surveys, Vegetation, Soil erosion, Alluvial channels, Sedimentation, Data collections.
Identifiers: *ERTS.

ERTS-1 imagery was used to inventory the effects of an episode of accelerated erosion that began in southern Arizona about 80 years ago. Around 1890 the larger streams in this region started actively to downcut their channels, bringing to an end an episode of generally sluggish episode that had lasted for about 4,000 years. The accelerated erosion still continues unabated and poses an ecological-environmental problem of great importance to this region. Causes of the post-1890 erosion still are not fully understood. Four principal causes have been hypothesized: overgrazing, adverse climatic change, reduction of burning of the rangeland, and increase in rodent and jack rabbit population. Overgrazing and climatic change are the two chief factors, and they probably acted together. A fundamental change has taken place in the plant ecology of the whole desert grassland region: grass has steadily declined in abundance and shrubs have increased markedly on the desert plains and foothills (notably mesquite but also burroweed, rabbitbrush, ocotillo, catclaw, and white thorn). ERTS imagery is used to evaluate the present status of post-1890 erosion in the Desert Grassland region, the rates of its increase in representative areas, its causal factors, and the degree of success of past and present ameliorative measures. (See also W73-14326) (Knapp-USGS)
W73-14329

THE NOAA/NESS PROGRAM OF REMOTE SENSING OF SOIL MOISTURE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-14330

METALLOGENIC SIGNIFICANCE OF ALASKAN GEOSTRUCTURES SEEN ON NIMBUS AND ERTS IMAGES,
E. H. Lathram.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 76, 1972.

Descriptors: *Remote sensing, *Satellites (Artificial), *Structural geology, *Geologic mapping, Exploration, Surveys, Mining, Data collections, *Alaska.
Identifiers: *ERTS.

The northeast- and northwest-trending set of traces of crustal structures shown on Nimbus images also appears on ERTS images of Alaska. Comparison of this set of structures with the distribution of mineral deposits and known major structures yields some interesting relations. In the Canadian Cordillera, the development of mineralized regions seems related to major crustal zones or fractures trending southwestward across the Cordillera from the Precambrian shield. In Alaska, the mineralized region of massive sulfides in Prince William Sound and upper Copper River areas and of porphyry coppers in the Nabesna area forms a broad northeast-trending belt possibly related to the Minto Arch on the shield. The belt of metalliferous deposits in the western Alaska Range follows a comparable northeast trend. Mercury deposits, together with most antimony and tungsten deposits, occupy a northeast-trending belt between the Bristol Bay-Mackenzie Bay linear and extensions of a linear along the lower Yukon River. This belt intersects the northwest-trending Canadian belt of similar deposits in the Fairbanks area. (See also W73-14326) (Knapp-USGS)
W73-14331

BASIC CONSIDERATIONS OF HIGH RESOLUTION SIDE-LOOKING RADAR IMAGERY,
Goodyear Aerospace Corp., Litchfield Park, Ariz. Sensor Applications Engineering.
For primary bibliographic entry see Field 07B.
W73-14332

THE APPLICATION OF RADAR AND INFRARED IMAGERY TO QUANTITATIVE GEOMORPHOLOGICAL PROBLEMS,
Texas Univ., Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 07B.
W73-14333

APPLICATION OF A DIRECTIONAL REFLECTANCE MODEL TO WHEAT CANOPIES UNDER STRESS,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 07B.
W73-14334

MULTISPECTRAL REMOTE SENSED IMAGE ANALYSIS BY A SPECIAL ELECTRONIC SYSTEM,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 07B.
W73-14338

PRODUCTION OF THEMATIC MAPS BY OPTICAL ANALOG PROCESSING OF COLOR TRANSPARENCIES,
Arizona Univ., Tuscon. Optical Sciences Center.
For primary bibliographic entry see Field 07B.
W73-14339

A COMPUTER PROGRAM FOR GENERATING SCATTERGRAMS ON THE CALCOMP PLOTTER,
Arizona Univ., Tucson. Dept. of Geography and Area Development.
F. T. Aldrich.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 216-231, 1972. 12 fig, 3 ref.

Descriptors: *Data processing, *Computer programs, *Charts, *Statistical methods, Statistics, Correlation analysis, Regression analysis.
Identifiers: *Scattergrams, *Data plotting.

A computer graphics system produces two-dimensional scattergrams on a moderately-sized digital computer and digital increment plotter. Scattergrams produced by this program are of publishable quality. The magnetic tape used to generate the graphs may be saved and played repeatedly to produce multiple copies for research distribution or final copy for reproduction. Accompanying the plotted output is a printed summary of the operations performed. The program also allows overlays of multiple sets of data plotted with different symbols for comparing similar information. (See also W73-14326) (Knapp-USGS)
W73-14340

REMOTE ANALYSIS OF AIRBORNE PARTICLES BY POLARIMETRY,
Arizona Univ., Tucson. Lunar and Planetary Lab.
For primary bibliographic entry see Field 07B.
W73-14341

THE APPLICATION OF SPACE IMAGERY TO ANTHROPOLOGY,
New Mexico Archeological Center.
For primary bibliographic entry see Field 07B.
W73-14342

THE KIN BINEOLA IRRIGATION STUDY: AN EXPERIMENT IN THE USE OF AERIAL REMOTE SENSING TECHNIQUES IN ARCHAEOLOGY,
New Mexico Archeological Center.
For primary bibliographic entry see Field 07B.
W73-14343

AN INTERDISCIPLINARY EVALUATION OF ERTS POTENTIAL FOR ARID REGIONS,
Nevada Univ., Reno. Renewable Resources Center.
P. T. Tueller.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 284-307, 1972. 1 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Arid lands, Deserts, Arizona, Aerial photography, Land use, Urbanization, Mapping, Recreation, Irrigation, Vegetation, Nevada, California, Data collections.
Identifiers: *ERTS.

Remote sensing from aircraft and spacecraft (ERTS-1) offers valuable supplemental source of information for the solution of land-use and environmental problems in arid regions. Much of the arid region is being rapidly populated and growth and development is expected to continue at an accelerating rate. This offers a good opportunity to evaluate the impact of man on the land and water systems. Arid regions possibly offer greater potential for the effective use of this imagery than many other parts of the country. The arid regions are generally cloud, smoke and haze free much of the year; they contain large homogeneous areas which are ideal for imagery calibration. A great variety of landforms are found in the desert and are often closely correlated with vegetation distribution, soil classification units, and land use and management. Data available for this study are NASA high flights (RB57F) in July of both 1970 and 1972. Red, green and blue bands, black and white infrared, color and color infrared multispectral data are available on 70 mm format at an approximate scale of 1:432,000. Color and color infrared photographs are also available. (See also W73-14326) (Knapp-USGS)
W73-14344

MONITORING THE EFFECTS OF A CHANGING RESOURCE BASE IN AN ARID LANDS AREA: THE WEST SIDE OF THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 07B.
W73-14345

GEOGRAPHIC INVESTIGATIONS ASSOCIATED WITH THE EROS PROGRAM OF THE DEPARTMENT OF THE INTERIOR,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 07B.
W73-14346

AUTOMATED PLOTTING AND UPDATE OF LAND USE MAPS AND RELATED INFORMATION IN SOUTH CENTRAL ARIZONA,
Geological Survey, Washington, D.C. Geographic Applications Program.

J. L. Place, and J. R. Wray.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Land Studies, p 328-343, 1972. 10 fig.

Descriptors: *Remote sensing, *Satellites (Artificial), *Land use, *Mapping, Data processing, Arid lands, Cities, Urbanization, Data collections, Farms, Arizona.
Identifiers: *ERTS, Phoenix (Ariz).

The Geographic Applications Program of the U.S. Geological Survey is participating in investigations in the Arizona Regional Ecological Test Site. This consists of land use mapping and change detection experiments at two different scales. A Calcomp 763 plotter was used to plot a land use map of the entire Phoenix Quadrangle. The urban and builtup areas around Phoenix are shown with different symbols representing cells for residential, commercial, industrial, urban open, transportation, and quarrying. The agricultural land is shown with different symbols representing tree crops and nontree crops. Desert parkland is shown, as is military property. Overlain on this is the black culture plate of the standard topographic quadrangle. In this way, much time is saved in adding place names, boundaries, grids, and information. When data are processed by a computer, the land use and data of information for both the new and old information are retained. In this way, trends can be monitored automatically. An updated map may be plotted automatically. (See also W73-14326) (Knapp-USGS)
W73-14347

PROGRESS ON GEOLOGIC-TERRAIN MAPPING FOR LAND-USE PLANNING IN THE TUCSON AREA,
Geological Survey, Denver, Colo.
R. B. Morrison.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies p 344-363, 1972. 6 fig.

Descriptors: *Remote sensing, *Terrain analysis, *Geologic mapping, *Hazards, Planning, Land use, *Arizona, Mapping, Surveys.
Identifiers: *Flood mapping, *Tucson (Ariz).

Land use planning should be founded on an inventory and appraisal of the whole natural environment, with an objective assessment of the various kinds of natural advantages and limitations. Also, different possibilities for land use at given sites should be tested according to systems concepts, so that unfavorable or hazardous situations or adverse environmental changes can be anticipated and avoided and the most desirable and least detrimental use of land can be promoted. The most fundamental environmental factors, other than climate, are geologic and terrain factors. Ranked in decreasing order of importance, they are: (1) topographic-geomorphic factors; (2) geologic factors; (3) hydrologic factors; and (4) soil factors. In most cases these geologic-terrain factors are more fundamental and relevant to proper land-use planning than social, economic, and political considerations. A large area surrounding Tucson, Arizona, is rapidly undergoing development for residential, commercial, and industrial uses. The development is proceeding without a comprehensive regional plan for potential land uses. To aid in planning, geologic-terrain maps were made for the 1,300 square-mile area in and around Tucson. These maps are to be published at 1:125,000 scale. They are produced mainly by interpretation of ultrahigh altitude color and color-infrared aerial photographs, controlled by available published and unpublished reports and maps and by some additional field observations. (See also W73-14326) (Knapp-USGS)
W73-14348

RESEARCH FOR APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENTS (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. Foster, and J. Johnson.
In: Proceedings of the Third Annual Conference on Remote Sensing in Arid Lands; Tucson, November 1972: Arizona University Office of Arid Lands Studies, p 364-373, 1972. 4 fig, 1 tab, 3 ref.

Descriptors: *Remote sensing, *Information exchange, Arizona, Planning, Universities, Governments.
Identifiers: *Technology transfer.

An interdisciplinary program is dedicated to the goal of remote sensing technology transfer and cooperation between faculty of the Office of Arid Lands Studies and local and state governmental entities interested in the application of remote sensing. The Advisory Committee is comprised of two University of Arizona representatives, two local governmental agency heads, two state agency personnel, and one federal employee involved in the EROS project. (See also W73-14326) (Knapp-USGS)
W73-14349

REMOTE SENSING OF IRRIGATION TECHNIQUES AND CROP PATTERNS IN THE DOUGLAS BASIN, ARIZONA,
For primary bibliographic entry see Field 07B.
W73-14350

WATER RESOURCES OF WISCONSIN--LAKE MICHIGAN BASIN,
Geological Survey, Washington, D.C.
E. L. Skinner, and R. G. Borman.
For sale by USGS, Washington, D.C. 20242 $1.50 per set. Hydrologic Investigations Atlas HA-432, 1973. 4 sheets, 42 ref.

Descriptors: *Water resources, *River basins, *Lake Michigan, *Hydrologic data, Streamflow, Runoff, Flow rates, Water yield, Water quality, Chemical analysis, Hydrologic cycle, Water demand, Water balance, Hydrologic budget, Water utilization, Precipitation (Atmospheric), Land use, Topography, Environmental effects, Maps, Irrigation, Planning.

This 4-sheet atlas describes the water resources of the Lake Michigan basin as an aid to water management. Described are the distribution, characteristics, and physical environment of the resource, as well as the hydrologic budget, water quality, water problems, and water use. The information will be used to select sites for systematically monitoring the effects of a changing environment on the hydrology of the area. Data were gathered from various agencies and collected during field investigations. The Lake Michigan basin is a 3,600 square mile drainage area that lies along eastern Wisconsin and borders the western shore of Lake Michigan. It consists of several subbasins whose main stem streams discharge directly into Lake Michigan and into Green Bay. The study area does not include basins whose main stem streams discharge into Green Bay from the west and south. Included in the Lake Michigan basin are Door, Kewaunee, Manitowoc, Ozaukee, and Sheboygan Counties and parts of Brown, Calumet, Fond du Lac, Kenosha, Milwaukee, Racine, Washington, and Waukesha Counties. (Woodard-USGS)
W73-14351

STATUS OF FLOOD-PLAIN MAPPING, GREATER PITTSBURGH REGION, PENNSYLVANIA, 1972,
Geological Survey, Carnegie, Pa.
R. M. Beall, and A. C. Lardieri.
Open file report, September 1972. 16 p, 1 map, 3 tab, 10 ref.

Descriptors: *Floods, *Flood plains, *Mapping, *Pennsylvania, Investigations, Programs, Planning, Flood protection, Flood data, Maps.
Identifiers: *Pittsburgh region (Penn).

The purpose is to show the extent of recent flood-mapping activity, the coverage by flood plain information reports in the six county Greater Pittsburgh region, and to provide summary information about the flood problems and flood investigations of urban places within the region. The Greater Pittsburgh regional studies deal chiefly with the six western Pennsylvania counties of Allegheny, Armstrong, Beaver, Butler, Washington and Westmoreland. Old flood studies have not been searched or referenced on the map because patterns and zones of inundation are subject to change. Flood-prone areas may be altered by encroachment from any or all sides, by channel improvement or floodwall or levee construction, or by the natural or enhanced channel processes of scour and fill. The flood-mapping activities shown are those of the U.S. Army Corps of Engineers, U.S. Geological Survey, and U.S. Department of Agriculture Soil and Conservation Service. Flood plain information reports released through 1971 are listed. (Woodard-USGS)
W73-14352

HISTORIC AND JUNE 1972 FLOOD ELEVATIONS, GREATER PITTSBURGH REGION, PENNSYLVANIA,
Geological Survey, Carnegie, Pa.
R. M. Beall.
Open-file report, September 1972. 11 p, 1 fig, 1 map, 2 tab, 11 ref.

Descriptors: *Floods, *Flood stages, *Peak discharge, *Pennsylvania, Historic floods, Correlation analysis, Map, Hydrologic data, Flood data, Flood discharge, Streamflow, Gaging stations.
Identifiers: *Pittsburgh region (Penn).

The flood of June 1972 was a notable one in a large part of the Greater Pittsburgh region. Tropical storm Agnes in late June 1972 had several peculiarities of behavior and effect. A six-county area (consisting of the Pennsylvania Counties of Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland) can claim its share of notoriety because of the severe flooding in the eastern tributaries of the Allegheny and lower Youghiogheny Rivers. The combined effect was a flood of notable magnitude along the lower reaches of the Allegheny and Monongahela Rivers and in the Ohio River for some distance downstream from Pittsburgh. Storm runoff from the Beaver River basin and the upper Monongahela was substantial but not unusual. Maps and tables show the extent by which the June flood exceeded or was below flood stage. In places where a flood-stage figure has not been established or is not relevant to the definition of that term, the distance above or below bankfull stage is shown and listed, if available. Record-breaking flood heights were observed at the following mapped and listed sites: Clarion River at St. Petersburg, and Redstone Creek at Waltersburg. New record maximums (not listed) were also observed in the upper Mahoning River basin and in other headwater basins in the eastern half of the region. (Woodard-USGS)
W73-14353

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 07B.
W73-14354

WATER USE, CONSUMPTION, AND OUTLOOK IN THE U.S. IN 1970,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 06D.
W73-14355

STRIP-MINED WATERSHED HYDROLOGIC DATA ACQUISITION STUDY,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07B.
W73-14368

THE COMPUTER-SYSTEMS APPROACH TO ENVIRONMENTAL PROTECTION, PLANNING AND MANAGEMENT: THE MALIBU WATERSHED,
California Univ., Los Angeles. School of Public Health.
For primary bibliographic entry see Field 05B.
W73-14371

SONAR MAPPING OF THE UNDERSIDE OF PACK ICE,
Wisconsin Univ., Middleton. Geophysical and Polar Research Center.
For primary bibliographic entry see Field 02C.
W73-14407

CALCULATION OF TURBIDIMETRIC MICROBIOLOGICAL VITAMIN ASSAY RESULTS, USING AN APL/360 COMPUTER PROGRAM,
Food and Drug Administration, Washington, D.C. Div. of Nutrition.
For primary bibliographic entry see Field 05A.
W73-14448

LAB AUTOMATION AT LOW COST,
Digital Equipment Corp., Maynard, Mass. Lab. Data Products Group.
D. Glover.
Research Development, Vol 24, No 5, p 22-25, May 1973. 3 fig.

Descriptors: *Laboratory equipment, *Costs, *Automation, Computers, Instrumentation, Data storage and retrieval, Data transmission, Flexibility.
Identifiers: *Computer design.

This discussion covers those factors that must be considered in choosing a low cost laboratory computer system. Such a system may be either (1) a small system which is expandable to a medium size system or into a satellite interfaced to a large central system, as the lab requirements expand, or (2) a full-blown, time-shared system. This, of course, depends on the need of the laboratory, funding and the resources it commands. Those common elements that exist in the instrumentation in the laboratory should be considered in choosing from the variety of approaches available. The approach obviously depends on the desired end result and the decision as to how it should be attained. Computer output, data storage, and resolution enhancement are also very important considerations. (Holoman-Battelle)
W73-14451

A PRELIMINARY BASELINE STUDY OF ROBERTS AND STURGEON BANKS,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 05A.
W73-14486

A PRELIMINARY WATER QUALITY SURVEY OF THE LOWER FRASER RIVER SYSTEM,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 05A.
W73-14487

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1971-NOVEMBER 30, 1972,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-14548

DECISIONS WITH INADEQUATE HYDROLOGIC DATA.
For primary bibliographic entry see Field 02A.
W73-14550

AN ECONOMIC APPROACH FOR EVALUATING THE ADEQUACY OF HYDROLOGIC DATA,
Queen's Univ., Kingston (Ontario).
For primary bibliographic entry see Field 02A.
W73-14551

DESIGN OF HYDROMETRICAL NETWORKS AND APPLICATION TO COLOMBIA,
World Meteorological Organization, Bogota (Colombia).
For primary bibliographic entry see Field 02A.
W73-14552

AN APPLICATION OF THE INADEQUATE HYDROLOGICAL DATA OF THE AFRICAN TROPICAL REGIONS IN ENGINEERING DESIGN,
National Council for Scientific Research, Lusaka (Zambia).
For primary bibliographic entry see Field 02A.
W73-14553

IMPROVEMENT OF HYDROLOGICAL SERVICES IN BOLIVIA,
World Meteorological Organization, La Paz (Bolivia).
For primary bibliographic entry see Field 07A.
W73-14554

SHORT DURATION RAINFALL DEPTH-DURATION-FREQUENCY MAP OF INDIA,
Assam State Electricity Board, Barapani (India).
For primary bibliographic entry see Field 02A.
W73-14555

COMPUTATIONS OF PEAK FLOODS WITH INADEQUATE HYDROLOGIC DATA,
Columbia Univ., New York.
For primary bibliographic entry see Field 02A.
W73-14556

DETERMINATION OF SOME HYDROLOGICAL FACTORS WITH A WELL RECORDER,
Ain Shams Univ., Cairo (Egypt).
For primary bibliographic entry see Field 02A.
W73-14557

THE USE OF TRACER DATA IN INCREASING THE INFORMATION ON HYDROLOGIC SYSTEMS,
Weizmann Inst. of Science, Rehovot (Israel). Isotope Dept.
For primary bibliographic entry see Field 02A.
W73-14558

CONCEPT OF A TECHNIQUE FOR AN ANALYSIS OF WATERSHED RUNOFF EVENTS,
Agricultural Research Service, Riesel, Tex. Soil and Water Research Div.
For primary bibliographic entry see Field 02A.
W73-14559

EXPERIENCE WITH A MONTHLY RAINFALL--RUNOFF TRANSFER FUNCTION MODEL,
Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 02A.
W73-14560

THE USE OF EVOP AS A HYDROLOGIC TOOL,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14561

A SIMULATION TECHNIQUE OF MONTHLY RUNOFF BY USE OF PRECIPITATION TIME SERIES AT MULTISTATIONS,
Hokkaido Univ., Sapporo (Japan). Dept of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14562

ON THE USE OF SHORT-TERM DATA FOR STREAMFLOW SYNTHESIS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14563

A SIMILAR STORM METHOD ON FILLING DATA VOIDS,
Tokushima Univ., (Japan). Dept. of Engineering.
For primary bibliographic entry see Field 02A.
W73-14564

ANALYSIS OF MONTHLY RAINFALL PROBABILITIES BY WEIGHTED TRANSFORMATION,
Engineering Consultants, Inc., Denver, Colo.
For primary bibliographic entry see Field 02A.
W73-14565

EVALUATION OF MULTIANNUAL FIRM HYDROELECTRIC POWER--A NEW METHOD,
Hidrotecnica Portuguesa, Lisbon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14566

INADEQUATE HYDROLOGIC DATA AND RESERVOIR CAPACITY,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14567

EFFECTS OF INADEQUACE OF HYDROLOGIC DATA ON RELIABILITY OF WATER RESOURCES DESIGN,
Osaka Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14568

EVALUATION OF DROUGHT EFFECTS AT LAKE ATITLAN,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 02A.
W73-14569

THE HYDROLOGICAL FEASIBILITY OF VARIABLE WATER SUPPLY POLICIES,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 02A.
W73-14570

AN APPRAISAL OF THE SIGNIFICANCE OF SIEVE INTERVALS IN GRAIN SIZE ANALYSIS FOR ENVIRONMENTAL INTERPRETATION,
Institute of Oceanographic Sciences, Taunton (England).
For primary bibliographic entry see Field 02J.
W73-14576

OCEANOGRAPHY (OKEANOGRAFIYA).
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 02L.
W73-14597

GLACIER PULSATIONS AND PROBLEM OF PREDICTING THEM ON THE MEDVEZHIY GLACIER (PUL'SATSII LEDNIKOV I PROBLEMA IKH PROGNOZIROVANIYA NA PRIMERE LEDNIKA MEDVEZH'YEGO (ZAPADNYY PAMIR)),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02C.
W73-14600

THEORETICAL ANALYSIS OF THE ROLE OF SUBSURFACE FLOW IN THE GENERATION OF SURFACE RUNOFF: 2. UPSTREAM SOURCE AREAS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-14608

INVESTMENT CRITERIA AND MATHEMATICAL MODELLING TECHNIQUES FOR WATER RESOURCES PLANNING IN ARGENTINA: THE MIT-ARGENTINA PROJECT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-14670

A SYSTEMS APPROACH TO SOLID WASTE MANAGEMENT IN ASIA: BANGKOK, THAILAND, AS A CASE STUDY,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05D.
W73-14674

HYDROLOGIC SIMULATION.
Lake County Regional Planning Commission, Waukegan, Ill.
For primary bibliographic entry see Field 04A.
W73-14685

08. ENGINEERING WORKS

8A. Structures

PROCEEDINGS - SIXTEENTH ANNUAL WATER CONFERENCE.
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W73-14224

FLOOD CONTROL REPORT, CASA GRANDE, ARIZONA, 1973.
Henningson, Durham and Richardson, Inc., Phoenix, Ariz.
For primary bibliographic entry see Field 04A.
W73-14476

OBION AND FORKED DEER RIVERS AND TRIBUTARIES, TENNESSEE AND KENTUCKY, INTERIM REPORT: HARRIS FORK CREEK.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W73-14502

CANAL BANK RETAINING WALL MEANS AND METHOD,
P. R. Jacobs, and M. L. Jacobs.
U. S. Patent No. 3,744,255, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 912, No 2, p 454, July 10, 1973.

Descriptors: *Patents, *Canal construction, Engineering structures, *Concrete-lined canals, Ecology, *Canal embankments, Recreation, Natural resources, Cast-in-place structures.

A concrete inclined canal bank retaining wall and method of constructing it are described. A canal is dug with inclined earthern banks. The concrete inclined retaining wall is poured onto the banks immediately after the canal is dug and before the canal becomes filled with water or the banks deteriorate because of rain storms or wave action. Expansion joints at spaced intervals along the length provide for expansion and contraction of the retaining walls upon changes in ambient temperatures. The sloping wall surface may be roughened to provide niches for sheltering marine life. (Sinha-OEIS)
W73-14698

WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W73-14716

8B. Hydraulics

ROUND HORIZONTAL THERMAL-BUOYANT JET IN A CROSS FLOW,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-14212

A MATHEMATICAL MODEL OF WATER ADVANCE AND FLOW IN SMALL EARTH CHANNELS,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-14369

LANCASTER COUNTY PLANNING COMMISSION: STORM DRAINAGE STUDY.
Weston (Roy F.), Inc., West Chester, Pa.

August 1970. 24 p, 10 ref, 3 append.

Descriptors: *Storm drains, *Storm runoff, Runoff, *Design criteria, *Drainage systems, Drainage, Environmental effects, Sewers, Drains, *Pennsylvania.
Identifiers: Storm intensity, *Lancaster County (Penn).

Design criteria are recommended which will provide the basis for the design of adequate storm drainage facilities for suburban, urban, industrial, and agricultural areas of Lancaster County Pennsylvania, where growth has changed many of its areas from principally rural farm orientation to a commercial-residential nature. An inventory is provided of the existing major storm drainage systems within the county and the scope of a future storm sewer report of a more comprehensive nature is suggested. Included within the recommended design criteria for storm drainage facilities are the basic runoff equations for the determination of the volume of runoff, using the 'Rational Method,' runoff coefficients relative to the various types of surfaces, and storm intensity duration curves for various frequency storms based on data supplied by U. S. Weather Bureau records. Gutter flow and inlet location, and erosion control are discussed. Maps relating to the major and minor sewer systems in the county are included. (Edwards-North Carolina)
W73-14490

LASER DOPPLER VELOCITY MEASUREMENTS OF SWIRLING FLOWS WITH UPSTREAM INFLUENCE,
California Univ., Santa Barbara.
K. L. Orloff, and H. H. Bossel.
Avaialable from NTIS, Springfield, Va 22151 as NASA CR-2284 Price $3.00 printed copy; $1.45 microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2284, July 1973. 42 p, 12 fig, 3 plate, 24 ref. NGR 05-010-025.

Descriptors: *Rotational flow, *Vortices, *Fluid mechanics, Analytical techniques, Velocity, Anemometers, Instrumentation, Flow measurement, Theoretical analysis, Equations, Reynolds number, Correlation analysis, Streamflow.
Identifiers: *Laser-doppler anemometer.

Swirling flow in a rotating tube is studied by flow visualization at a moderate Reynolds number, and its velocity field is measured by laser-Doppler anemometry. The tube has constant diameter, and approximately uniform initial rigid rotation of the flow is assured by passing the flow through a rotating plug of porous metal before it enters the test section. At moderate swirl values, an object mounted on the tube centerline causes a closed bubble to form upstream of the obstacle, with a clearly defined stagnation point on the axis, and recirculating flow inside the bubble. The bubble length grows upstream as the swirl is increased, until it breaks up into a Taylor column reaching all the way upstream and downstream at swirl values above a certain critical value. A vortex jump (in the sense of Benjamin) occurs downstream of the obstacle except when the Taylor column is present. Using a laser Dopper anemometer, axial and swirl velocity profiles are obtained at several stations upstream and downstream of the bubble, and in and around the bubble. The experimental velocity profiles, the stream surface plots, and the velocity distribution on the axis are compared with the corresponding results of solutions to the equation of inviscid rotating flow. (Woodard-USGS)
W73-14571

PROBLEMS OF GROUNDWATER USE AND CONSERVATION IN LITHUANIA (VOPROSY ISPOL'ZOVANIYA I OKHRANY PODZEMNYKH VOD YUZHNOY PRIBALTIKI).
For primary bibliographic entry see Field 04B.
W73-14606

WAVE MEASUREMENTS OFF OXNARD, CALIFORNIA,
Naval Civil Engineering Lab., Port Hueneme, Calif.
W. E. Hoffman.
Available from the National Technical Information Service as AD-451 129, $6.00 in paper copy, $1.45 in microfiche. Report No. NCEL-TN-530, August 1964. 52 p, 33 fig, 6 tab, 5 ref.

Descriptors: *Breakwaters, *Harbors, Jetties, Beaches, *Coastal engineering, *Waves (Water), Equipment, Ocean waves, Engineering structures, *Sediment transport, *California.
Identifiers: Nearshore processes, Sand bypassing, *Littoral sand drift, Beach stabilization, Sand transport, Oxnard (Calif).

A description is presented of a mainly water level (wave) measuring complex in about 18 feet of water behind and in the vicinity of an off-shore breakwater for a small craft harbor. The breakwater serves as a trap for sand which is by-passed periodically around the jetties of a major harbor about one mile downshore (Port Hueneme, California). Instruments and methods are discussed for the complex as progressively improved over a 10 year period beginning in 1953. Types of measurements are presented with typical daily average: Surface water level variation from three stations-height 1.5 feet and period of 11.3 seconds; water temperature 60 degrees F; breaking wave height 2.9 feet and 6.5 period; littoral current velocity-SE set at 60 feet/minute-wind velocity on-shore at 15 knots. The beach and sea surface were recorded on photographs periodically. All data collected was sent to Coastal Engineering Research Center for analysis and reporting. The data are intended to improve the understanding of behavior of waves and beaches behing and in the vicinity of an off-shore breakwater. Effective July 1964, the Los Angeles District of the Corps of Engineers assumed responsibility for the complex. The information presented is considered useful mainly to those planning subject type installation. (Sinha-OEIS)
W73-14625

LABORATORY STUDY OF SEICHING INDUCED ON AN OFFSHORE SHELF,
Naval Civil Engineering Lab., Port Hueneme, Calif.
L. E. Robson, and D. B. Jones.
Available from the National Technical Information Service as AD-653 711, $6.00 in paper copy, $1.45 in microfiche. NCEL Technical Note N-895, February 1967. 46 p, 25 fig, 5 tab, 13 ref, 2 append.

Descriptors: Beaches, *Seiches, *Waves (Water), *Coastal engineering, *California, *Nuclear explosions.
Identifiers: *Mono Lake (Calif), Wave tank experiments, Dispersive wave trains, Long period waves.

An exploratory investigation was made in the laboratory wave tank to determine whether with existing equipment an oscillation (seiche) of the water over a submerged shelf just offshore could be induced by an incident train of shorter waves and if so, whether the run-up from the wave system on the beach would thereby be affected significantly. This study was a phase of current work dealing with the run-up and other shore effects of surface gravity waves from underwater explosions. When the wave-maker was set to generate short waves, a low-amplitude dispersive train preceded the regular (periodoc) train. Weak low-frequency oscillations in the run-up record occurring prior to the arrival of the periodic train were detected in seven of eighteen runs analyzed, the frequencies agreeing with estimates of first-mode shelf-seiche frequencies. A special run-up factor was evaluated for four of seven runs; it indicated maximum run-up in the long-period wave spectrum along of from 35% to 85% of the maximum run-up in the spectrum of the incident dispersive waves. The highest value was associated with the highest incident train. From these results it was concluded that a seiche existed in some of the runs. It is believed that the principal reason why no oscillation was detected in other runs is that the heights of the incident dispersive waves (which could not be increased) were too small. When the wave-maker was set to generate long waves, the initial waves at the shelf were those of the periodic train. (Sinha-OEIS)
W73-14627

REFRACTION OF DISPERSIVE WAVES ON A BEACH,
Naval Civil Engineering Lab., Port Hueneme, Calif.
J. R. Evans, and D. G. True.
Available from the National Technical Information Service as AD-618 876, $3.00, in paper copy, $1.45 in microfiche. NCEL Technical Note N-738, June 1965. 26 p, 15 fig, 2 tab, 2 ref.

Descriptors: *Refraction (Water waves), *Beaches, Coasts, *Coastal structures, *Nuclear explosions, Earthquakes, *Tsunamis, Coastal engineering, *Breakwaters, Piers.
Identifiers: *Dispersive waves, Near shore processes, Refraction patterns, Underwater earthquakes, Water shock, Snell's Law, Green's Law.

This study concerns measurements in the laboratory of refraction patterns of dispersive waves on a veach and the comparison of results with those predicted by theory. The object was to determine the effects of nuclear explosive excited surface water waves, air blast and water shock on piers, breakwater and other waterfront structures. Dispersive waves are also generated by earth movements under water which generate tsunamis. Beaches front many waterfront structures and hence affect wave loading on the structures. It was found that refraction of dispersive type waves on a beach may be predicted by use of Snell's Law, and amplitudes of refracted waves may be predicted by a modified form of Green's Law. (Sinha-OEIS)
W73-14628

EXPERIMENTAL STUDY OF LONGSHORE CURRENTS ON A PLANE BEACH,
C. J. Galvin Jr., and P. S. Eagleson.
Available from the National Technical Information Service as AD-615 790, $3.00 in paper copy, $1.45 in microfiche. Technical Memorandum No. 10, January 1965. 88 p, 38 fig, 12 tab, 35 ref, 1 append.

Descriptors: *Beaches, *Erosion, Deposition (Sediments), Sedimentation, *Sediment transport, *Coasts, *Waves (Water).
Identifiers: *Near shore processes, *Longshore currents, Surf zone, Wave effects.

Measurements were made of the characteristics of breaking waves and the resulting longshore currents for 34 combinations of wave height (up to 0.22 foot), period (0.90 to 1.50 seconds), and breaker angle (up to 32 degrees), along a 20-foot test section of a 30-foot plane, smooth concrete beach with a slope of 0.104. Observation and measurement show that most of the fluid in the surf zone stays there, and that longshore current velocity initially increases downstream from an obstacle. Velocity increases along the beach because the fluid forming the breaking wave has been withdrawn from the surf zone, and thus already has a longshore component of motion, to which is added the longshore component of motion of the breaking wave. A differential equation for this non-uniform flow agrees qualitatively with the measured variation of velocity with breaker angle and with distance from an obstacle. The non-uniformity of the flow was also indicated by the mean water level, which increased, and the breaker position and runup limit, which moved shoreward, downstream from the obstacle, but there is a possibility that these measurements were affected by the experimental apparatus. The energy used to maintain the flow of longshore currents is a small fraction (less than 1/10) of the energy brought to the surf zone by shoaling waves. The mean velocity of uniform longshore currents is approximately given by $V \pm gmT \sin 20b$, an equation which is one form of the conservation of mass in the surf zone. (Sinha-OEIS)
W73-14630

WATER WAVES FROM UNDERWATER EXPLOSIONS IN SHALLOW WATER, PART II: CHARACTERISTICS OF WAVES NEAR THE SHORELINE AND METHOD OF ESTIMATING WAVE FORCES ON A VERTICAL BARRIER,
Naval Civil Engineering Lab., Port Hueneme, Calif.
H. Wang.
Available from the National Technical Information Service as AD-665 799, $6.00 in paper copy, $1.45 in microfiche. Report No. NCEL-TN-945-Pt-2, January 1968. 61 p, 35 fig, 10 ref, 1 append.

Descriptors: Ocean waves, Beaches, Shores, *Sea walls, Seashores, Data processing, *Barriers, *Waves (Water), *Nuclear explosions.
Identifiers: *Near shore processes, Incident wave shape, Water particle velocity, *Wave profiles, Surface gravity waves, Beach slope.

The characteristics of dispersive water waves--wave celerity, water particle velocity, and wave deformation--were studied in the laboratory in a region adjacent to the shoreline on a beach which has a 1:14 slope. The waves were generated by immersing a plunger at a distance from the shoreline in water of constant depth. A numerical scheme for the calculation of mean water particle velocity in the horizontal direction was developed according to the principle of continuity. This scheme is highly stable and is suitable for small computer facilities such as the IBM 1620. Methods for the estimation of wave forces and pressures on a vertical barrier, mounted as a seawall, were developed. The methods are based on momentum consideration and require knowledge of the water particle velocity in the horizontal direction and the shape of the incident wave. (Sinha-OEIS)
W73-14634

A CASE STUDY OF LITTORAL DRIFT BASED ON LONG-TERM PATTERNS OF EROSION AND DEPOSITION,
Johns Hopkins Univ., Baltimore, Md. Cheaspeake Bay Inst.
For primary bibliographic entry see Field 02L.
W73-14641

MODELLING TECHNIQUES FOR A SYSTEM ENGINEERING APPROACH OF THE PROBLEMS OF WATER USES FOR AGRICULTURAL PURPOSES,
Padua Univ. (Italy). Instituto di Elettrotecnica e di Elettronica.
A. Lepschy, S. Milo, and D. Torriano.
In: Systems Approaches to Developing Countries, Proceedings of Symposium, sponsored by International Federation of Automatic Control and the International Federation of Operational Research Societies, Algiers, Algeria, May 28-31, 1973, p 491-497, 1973. 6 fig.

Descriptors: *Hydraulic engineering, *Hydraulic systems, *Mathematical models, *Systems analysis, *Simulation analysis, *Design, Agriculture, Water users, Resource allocation, Canals, Networks, Reclamation, Irrigation, Computers, *Irrigation.
Identifiers: State variable approach, Hydraulic plants, Developing countries.

The problems of reclamation and irrigation plants are becoming increasingly important for a better exploitation of agricultural resources and for the improvement of land use. The main results hitherto obtained in the field of hydraulic system simulation are summarized and a possible exploitation of these methods for design purposes is presented. Techniques are suggested to derive mathematical models for studying the most important problems which arise in the design and control of hydraulic plants. A main characteristic of the models considered is the adoption of a state variable approach, and the use of those techniques which refer to system theory and are suitable for the

computer approach to problems of system engineering concerning land use. A state variable model of canal networks for agricultural purposes is presented; this model may be set up by combining elementary block diagrams corresponding to the main kinds of subsystem into which the whole system may be subdivided. A model for a hydraulic hoisting reclamation plant is discussed and the approach to the solution of a design problem is presented based on the comparison of the values of some performance indexes corresponding to different control policies. (Bell-Cornell)
W73-14673

DISPLACEMENT MECHANICS IN PRIMARY CEMENTING,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 08F.
W73-14703

PRESSURE TRANSIENT ANALYSIS OF NATURALLY FRACTURED RESERVOIRS WITH UNIFORM FRACTURE DISTRIBUTION,
Atlantic Richfield Co., Dallas, Tex.
H. Kazemi.
Society of Petroleum Engineers Journal, Vol 9, No 4, p 451-462, December, 1969. 13 fig, 4 tab, 15 ref.

Descriptors: *Fractures (Geologic), *Oil reservoirs, *Porosity, *Porous media, Pressure, Drawdown, Fluid flow, Heterogeneity, Homogeneity, Unsteady flow, Mathematical models, Storage capacity.
Identifiers: *Pressure transient analysis, Boundary effects, Skin effect, Warren-Root equations.

A number of papers are reviewed on the analysis of flow and buildup tests for obtaining reservoir characteristics. An ideal theoretical model of a naturally fractured reservoir with a uniform fracture distribution is presented. This model consists of a finite circular reservoir with a centrally located well and two distinct porous regions, referred to as matrix and fracture. The matrix has high storage but low flow capacity. The fracture has low storage, but high flow capacity. The flow in the entire reservoir is unsteady state. In general, the analysis of a naturally fractured reservoir from pressure transient data relies considerably on the degree and type of heterogeneity of the system. Testing procedures and facilities are sometimes as important. Nevertheless, under favorable conditions, calculations should be possible of in-situ characteristics of the matix-fracture system, such as pore-volume ratio, overall capacity of the formation, total storage capacity of the porous matrix, and some measure of matrix permeability. The behavior of a fractured reservoir approaches that of an equivalent system of homogeneous reservoir at large times. (Gray-NWWA)
W73-14708

EFFECT OF ANISOTROPY AND STRATIFICATION ON PRESSURE TRANSIENT ANALYSIS OF WELLS WITH RESTRICTED FLOW ENTRY,
Atlantic Richfield Co., Dallas, Tex.
H. Kazemi, and M. S. Seth.
Journal of Petroleum Technology, Vol. 21, No. 5, p 639-646, May, 1969. 9 fig, 15 ref.

Descriptors: *Flow resistance, *Anisotropy, *Stratification, *Pressure, Drawdown, Productivity, Flow, Subsurface flow, Mathematical models.
Identifiers: *Drill-stem tests, *Boundary conditions, Buildup, Interference test, Pressure transient analysis.

A numerical model was devised with a more realistic boundary condition than in earlier studies. A chart is provided to include the effect of anisotropy in production impairment estimations. The results of the conventional interference test analysis, which are based on total penetration, can be applied to reservoirs, with restricted flow entry Equations were derived to calculate the proper duration of flow and buildup tests. These equations can be used in analyzing short-term tests, such as drill-stem tests, and as a preliminary measure in tests designed to indicate permeability stratification. (Gray-NWWA)
W73-14710

TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
Illinois State Geological Survey, Urbana
For primary bibliographic entry see Field 04B.
W73-14714

BURST RESISTANCE OF PIPE CEMENTED INTO THE EARTH,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 08F.
W73-14715

FACTORS THAT AFFECT WELL LIFE,
Universal Oil Products, St. Paul, Minn. Johnson Div.
R. L. Schreurs.
Irrigation Age, Vol 4, No 9, p 12, 14-15, 18, April, 1970. 2 fig.

Descriptors: Wells, *Water wells, Iron bacteria, Chemical reactions, Bactericides, Groundwater, *Scaling, Corrosion, *Aquifer characteristics.
Identifiers: *Well development, *Acidizing, Well efficiency, Pumping tests, Incrustation.

The expected service life of a well might be judged in somewhat the same way as human life expectancy. This analogy between wells and humans can be carried further in that both are prevented from producing at the highest level of their capabilities by causes completely foreign to themselves. There is nothing that can be done to the well itself to overcome such difficulties, but it is important to be able to recognize these outside causes so as not to waste time and money trying to solve them by treating the well. There are, however, a number of things which can cause the well to perform below its capability. These are a result of damage to the well itself and can be corrected by proper treatment. The most important of these is the clogging (incrustation) of the well screen or slotted portion of the well casing. An in-depth discussion of the common forms of incrustation and appropriate treatments is presented and a hypothetical study is graphically depicted. Stressed is the point that an incrusted well is inefficient and costly. To insure long, trouble-free life, a well should be inspected regularly, precise records kept and proper treatment applied at the appropriate time. (Cambell-NWWA)
W73-14723

SOME EFFECTS OF SIZE DISTRIBUTION ON PARTICLE BRIDGING IN LOST CIRCULATION AND FILTRATION TESTS,
Texas Univ., Austin.
C. Gatlin, and C. E. Nemir.
Journal of Petroleum Technology, Vol 13, No 6, p 575-578, June, 1961. 4 fig, 3 tab, 19 ref.

Descriptors: *Particle size, *Particle gradation, *Filtration, *Well filters, Gravels, *Granules, Bentonite, *Drilling fluids.
Identifiers: *Particle bridging, Maximum packing density, Filter cake permeability, Spurt loss, Lost circulation, Nut shells, Furnas method.

Particle size distribution such as to provide maximum density of beds of packed solids (according to the method of Furnas) was investigated in a laboratory study of loss of mud circulation and filter cake formation. Tests on the bridging and sealing of a wedge-shaped slot showed that a maximum density distribution of nut shell particles was more effective than a randomly selected sample of the commercial product. Samples of fractionated bentonite were used in mud filtration tests on paper and on sandstone cores. Size range of the bentonite particles was 0.05 to 40 microns. The spurt loss at the beginning of filtration was least with the maximum density distribution but the rate of filtration following the initial spurt was lowest in the mud with a preponderance of the small particles (which could not be considered as inert). The suggestion is offered that the Furnas theory may have application in the selection of aggregate for gravel packs and other filtration conditions. (Gray-NWWA)
W73-14726

THE HORIZONTAL WELL AS A NEW METHOD OF RANGE WATER DEVELOPMENT,
Agricultural Research Service, Tucson, Ariz.
J. T. Welchert, and B. N. Freeman.
Progressive Agriculture in Arizona, Vol 21, No 6, p 8-11, November-December, 1969. 6 fig, 1 tab.

Descriptors: *Wells, *Water wells, Aquifer characteristics, *Groundwater, *Water sources, *Aquifers, Seepage, Springs.
Identifiers: *Horizontal wells, Trapped water, Controlled seepage area, Cased springs.

Providing stock water where desired at a price that is reasonable has always been a problem for the stockman. Conventional systems such as dirt tanks, catchment basins, vertical wells and springs have been satisfactory in some cases but each has a characteristic limitation. With the introduction of horizontal wells the potential is to tap relatively small, trapped water supplies that go undeveloped in conventional vertical well drilling. These systems are closed, gravity powered, inexpensive, efficient, reliable, sanitary and maintenance-free. A point which is stressed is that 'horizontal wells' cannot be drilled just anywhere. Proper site selection, using reliable indicators, and the recognition of the two basic types of trapped waters, the dike and the contact source, are the keys to successful well development. Equipment, methods of development and system advantages are discussed. (Smith-NWWA)
W73-14729

A FIELD STREAMING-POTENTIAL EXPERIMENT,
Schlumberger Well Surveying Corp., Ridgefield, Conn.
For primary bibliographic entry see Field 08G.
W73-14731

8C. Hydraulic Machinery

PUYALLUP HATCHERY POND AND PUMPING PLANT CONSTRUCTION,
Washington State Dept. of Fisheries, Olympia.
For primary bibliographic entry see Field 08I.
W73-14357

RIVERSIDE'S GROUND WATER PUMPING SYSTEM.
FMC Corp., Los Angeles, Calif. Peerless Pump Div.
For primary bibliographic entry see Field 04B.
W73-14478

IMPLICATIONS OF PLLRC TAX RECOMMENDATIONS FOR FEDERAL HYDRO PROJECTS AND POWER FACILITIES,
Tennessee Valley Authority, Knoxville. Div. of Navigation Development and Regional Studies.
For primary bibliographic entry see Field 06E.
W73-14512

EVALUATION OF MULTIANNUAL FIRM HYDROELECTRIC POWER--A NEW METHOD,
Hidrotecnica Portuguesa, Lisbon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14566

EFFECTIVENESS OF THE OPTIMIZATION OF THE INPLANT REGIMENS OF HYDROELECTRIC PLANTS,
V. D. Urin.
Hydrotechnical Construction, ASCE, No 10, p 976-979, October 1972. 1 fig, 2 tab, 6 ref. (Translated from Gidrotekhnicheskoe Stroitel'stvo, No. 10, p 37-39, October 1972).

Descriptors: *Hydroelectric plants, *Regimen, *Optimization, Dynamic programming, Economic efficiency, Evaluation, Load distribution, Flow, Benefits, Hydraulic structures, Hydraulic turbines, Conduits, Mathematical models, Systems analysis, Equations.
Identifiers: *Effectiveness, Operating characteristics.

Optimization of a hydroelectric plant regimen for a given load calls for the solution of three mutually related problems of selecting the optimum: (a) number of operating units--obtainable from the average characteristics of the units, aided by simple automation; (b) composition of the operating units--effectiveness depends upon number of operating units and number installed; and (c) load distribution among the units. Evaluation is made of the effectiveness of each of the three optimization elements, utilizing the experience obtained from many analyses made at the electric shop of ORGRES Trust from 1966-1969. Flow and relative growth characteristics have been constructed for 20 hydroelectric plants in Transcaucasia, with use made of data from full-scale investigations for 19 of these plants. The inplant regimen was optimized by the method of combined characteristics, which is a graphical analogue of dynamic programming. To control the analyses, the energy characteristics of one of the plants was obtained also by dynamic programming. It is concluded that optimization of the inplant regimens for hydroelectric plants yields substantial advantages and its introduction is necessary in order to increase the technical-economic indices of the plants. (Bell-Cornell)
W73-14668

HYDRAULIC JETTING--SOME THEORETICAL AND EXPERIMENTAL RESULTS,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 08G.
W73-14733

8D. Soil Mechanics

SELECTED BIBLIOGRAPHY ON LABORATORY AND FIELD METHODS IN GROUND WATER HYDROLOGY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-14711

PHYSICAL AND THERMAL PROPERTIES OF FROZEN SOIL AND ICE,
Continental Oil Co., Ponca City, Okla.
L. H. Wolfe, and J. O. Thieme.
Society of Petroleum Engineers Journal, Vol 4, No 1, p 67-72, March, 1964. 14 fig, 5 ref.

Descriptors: *Frozen soils, *Ice, Permafrost, *Tensile strength, *Shear strength, *Compressive strength, Thermal conductivity, Specific heat, Thermal properties, Clay, Silt, Soil moisture, Underground storage, Cryogenics, Soil physical properties.
Identifiers: Thermal diffusivity, Liquified gas storage.

Underground storage of cryogenic liquids, such as liquid natural gas, requires prior knowledge of the strength and thermal characteristics of the soil. Methods are described for the measurement of tensile, compressive and shear strengths, specific heats and thermal conductivities of soils. These properties were measured on a clay and a silt, at moisture contents of 17% and 22%, at temperatures from ambient to -195C. Thermal diffusivity values for silt, clay and ice were calculated. Diffusivity increased with the moisture content. Lowering the temperature increased the strength of the soils. Thermal properties of frozen soils are more dependent on moisture content than on temperature. (Gray-NWWA)
W73-14717

THE EFFECT OF STRESS ON PERMEABILITY OF SANDSTONE CORES,
California Univ., Berkely.
I. Fatt.
Society of Petroleum Engineers Journal, Vol 3, No 2, p 95-100, June, 1963. 11 fig, 14 ref.

Descriptors: *Permeability, Permeameters, Flow, Rock properties, *Sandstone, *Stress, Pressure, Earth pressure.
Identifiers: Boise (Idaho), Berea (Ohio), Grubb (California), Permeability anisotropy, Permeability reduction, Nonuniform stress, Radial stress, Axial stress.

Studies are reported on the permeability anisotropy and the permeability under nonuniform stress of cores of Boise, Berea, and Grubb sandstones. Permeability anisotropy was a function of overburden pressure. Increase in applied stress from 0 to 5000 psig caused a significantly greater reduction in vertical permeability than in horizontal. Boise and Berea sandstones showed increasing isotropy at higher applied stress. Permeability reduction under nonuniform stress was less than that under uniform stress. Grubb sandstone was very sensitive to overburden pressure. Permeability reduction of the Berea and Grubb sandstone cores subjected to simulated overburden pressure was a function of the ratio of the radial to axial stress. (Gray-NWWA)
W73-14718

THE ALTERATION OF ROCK PROPERTIES BY PERCUSSION SIDEWALL CORING,
Shell Oil Co., Ventura, Calif.
For primary bibliographic entry see Field 08E.
W73-14730

8E. Rock Mechanics and Geology

OPTIMIZATION OF WATER RESOURCE SYSTEMS INCORPORATING EARTHQUAKE RISK: 1973 CONTRIBUTIONS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 06A.
W73-14204

STRENGTHENING ROCK BY INJECTION OF CHEMICAL GROUT,
Corps of Engineers, Omaha, Nebr. Missouri River Div.
For primary bibliographic entry see Field 08G.
W73-14704

A LIQUID FREON PERMEAMETER,
Socony Mobil Oil Co. Inc., Dallas Tex.
For primary bibliographic entry see Field 08F.
W73-14706

TEMPERATURE PROSPECTING FOR SHALLOW GLACIAL AND ALLUVIAL AQUIFERS IN ILLINOIS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 04B.
W73-14714

THE EFFECT OF STRESS ON PERMEABILITY OF SANDSTONE CORES,
California Univ., Berkely.
For primary bibliographic entry see Field 08D.
W73-14718

EXPERIMENTAL TESTS OF A METHOD FOR DRILLING WITH EXPLOSIVES,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 08H.
W73-14719

THE BOREHOLE TELEVIEWER--A NEW LOGGING CONCEPT FOR FRACTURE LOCATION AND OTHER TYPES OF BOREHOLE INSPECTION,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 08G.
W73-14721

EFFECT OF OVERBURDEN PRESSURE ON SOME PROPERTIES OF SANDSTONES,
California Univ., Berkeley.
V. M. Dobrynin.
Society of Petroleum Engineers Journal, Vol 2, No 4, p 360-366, December, 1962. 12 fig, 14 ref.

Descriptors: *Overburden, *Pressure, Physical properties, *Porous media, *Compressibility, Density, Resistivity, Permeability, Seismic waves, Poisons, Ratio, Mathematical studies, *Sandstones, Pressure.
Identifiers: Longitudinal waves.

Experimental data show that physical properties of porous rocks change under pressure. Two sandstones were examined in the overburden pressure range from 0 to 20,000 psi while the internal pore pressure was atmospheric in one series and 1800 psi in another. Physical properties measured were compressibility, density, resistivity, permeability, and velocity of longitudinal waves. Changes in physical properties are determined to a large extent by the pore compressibility. Pore compressibility can be calculated (in the pressure range investigated) by knowing the maximum pore compressibility andthe magnitude of the pressure. Mathematical equations were developed that describe the effect of pressure on significant physical properties of sandstones. These relationships are shown graphically. (Gray-NWWA)
W73-14724

ROCK STRESSES INDUCED BY FLOW OF FLUIDS INTO BOREHOLES,
Rice Univ., Houston, Tex.
P. R. Paslay, and J. B. Cheatham, Jr.
Society of Petroleum Engineers Journal, Vol 3, No 1, p 85-94, March, 1963. 9 fig, 5 ref.

Descriptors: *Rock properties, *Shear strength, *Stress, Strength, Boreholes, Flow, Saturated flow, Permeability.
Identifiers: *Borehole stability, *Permeability reduction, Displacement distribution, Water shutoff.

In many cases, an increased production rate effected by substantially increasing the pressure gradient through the formation adjacent to the borehole causes excessive sand production, wear of production equipment and necessitates reworking the well. A mathematical analysis was made of the steady state flow rates, stresses and displace-

ments developed in the vicinity of the borehole by applied surface loads and flow of liquids from a rock formation saturated with an incompressible fluid. To prevent rock failure, the rock shear strength must be approximately two-thirds the formation fluid pressure. Permeable rocks sometimes become partially plugged during normal completion and production of a well. The analysis showed that if a region of permeability reduction of 1000:1 extends to a radial thickness of 1 per cent of the borehole diameter, the rock must be about 80 percent stronger than for the unplugged state. No additional rock strength is required for a stable borehole if plugging extends beyond 15 percent of the hole diameter, although a further decrease of production rate is obtained. If gradual plugging occurs during production of a well, the borehole wall will fail when the plugged region extends to a thickness at which the required rock strength exceeds the actual rock strength. (Gray-NWWA)
W73-14725

CORRELATIONS OF PHYSICAL PROPERTIES OF POROUS MEDIA,
Texas A and M Univ., College Station.
W. D. Von Gonten, and R. L. Whiting.
Society of Petroleum Engineers Journal, Vol 7, No 3, p 266-272, September, 1967. 2 tab, 7 ref.

Descriptors: *Physical properties, Correlation analysis, *Regression analysis, *Porosity, *Permeability, Density, *Porous media, Sandstone, Limestone, Young's modulus, Poisson's ratio.
Identifiers: Formation factor, Shaliness factor, Shear modulus, Capillary pressure curve, Pore radius, Displacement pressure.

Physical properties were measured on 568 oil well cores from the Illinois Basin, Rock Mountain area, California, Louisiana and Texas; 478 were sandstone; 90 limestone. Properties obtained on all samples were porosity, grain density, air permeability, formation factor, shaliness factor, mercury-injection capillary pressure curve, midpoint pore radius, average pore radius, equation of capillary pressure curve, and displacement pressure. On 123 sandstone and 61 limestone samples, sonic velocities of the compressional and shear waves were measured and Poisson's ratio, Young's modulus, shear modulus, bulk modulus and sonic velocity were calculated. A regression analysis program was used on a computer to evaluate the coefficients of the equations and to determine which independent variables were significant in each equation. Seven equations are presented for predicting porosity, formation factor and permeability. These equations should be useful in contributing to the understanding of the relationship between the physical properties of porous media. (Gray-NWWA)
W73-14728

THE ALTERATION OF ROCK PROPERTIES BY PERCUSSION SIDEWALL CORING,
Shell Oil Co., Ventura, Calif.
G. M. Webster, and G. E. Dawsongrove.
Petroleum Transactions, AIME, Vol 11, No 4, p 385-388, April, 1959. 12 fig, 1 tab, 1 ref.

Descriptors: *Cores, *Porosity, *Permeability, *Rock properties, *Sandstones, Laboratory tests, Capillary action, Physical properties, Porous media.
Identifiers: Sidewall cores, Conventional cores, Diamond cores, Oil content, Water content, Percussion coring, Thin sections, Photomicrographs.

Percussion sidewall cores from nine oil-productive sandstone zones were compared with conventional cores from the same zones. Photomicrographs of thin sections from sands recovered by percussion sidewall coring indicated some shattering and readjustment of the grains. Disturbance was more pronounced in harder, less porous sands. Porosities of sidewall samples were significantly higher for the less porous sands than for samples from conventional cores. Little difference was noted when the porosity of the conventional core sample was 20% or greater. Limited data indicates that permeabilities of percussion core samples are lower than those of conventional samples, except in the low permeability range, in which case, the reverse may be found. Mercury capillary pressure determinations indicate that the effective pore size and pore size distribution have been appreciably altered in the percussion cores. Somewhat higher water contents and lower oil contents in the sidewall cores can be attributed to invasion of mud filtrate. (Gray-NWWA)
W73-14730

A STUDY OF FORMATION PLUGGING WITH BACTERIA,
Alberta Univ., Edmonton.
J. T. Raleigh, and D. L. Flock.
Journal of Petroleum Technology, Vol 17, No 2, p 201-206, February, 1965. 12 fig, 1 tab, 13 ref.

Descriptors: *Bacteria, *Injection, *Flooding, *Sands, *Limestones, Brines, Porous media, Capillary action, Pores, Rock properties.
Identifiers: *Bacillus subtilis, Capillary pressure curves, Pore-geometry factor, Thomeer, Displacement pressure, *Formation plugging.

The injection of water into formations may be decreased, or the pressure increased, in consequence of plugging of the porous rock by bacteria in the injected water. In a laboratory study, the injection rate and concentration of bacteria were held constant in tests on two sandstones and two limestones. Bacillus subtilis (dead) was suspended in 2.5% sodium chloride solution. The pore geometry factor (Thomeer) was calculated from measurements of properties of the 15 cores examined. The pore geometry factor is a measure of the sorting and interconnection of the pore sizes. Results showed that the factor was a significant rock characteristic for correlation with depth of plugging but failed as an indicator of rate of plugging. Neither permeability nor irreducible water saturation correlated with rate of plugging. The pore geometry factor might have application in establishing injection water specifications in more homogeneous rocks having only primary porosity development. (Gray-NWWA)
W73-14732

8F. Concrete

CANAL BANK RETAINING WALL MEANS AND METHOD,
For primary bibliographic entry see Field 08A.
W73-14698

DISPLACEMENT MECHANICS IN PRIMARY CEMENTING,
Esso Production Research Co., Houston, Tex.
R. H. McLean, C. W. Manry, and W. W. Whitaker.
Journal of Petroleum Technology, Vol 19, No 2, p 251-260, February 1967. 19 fig, 2 tab, 16 ref.

Descriptors: *Cements, *Slurries, *Mud, *Casings, Flow, Laminar flow, Turbulent flow, *Non-Newtonian flow, Gels, Yields strength, Reynolds number.
Identifiers: Flow patterns, *Slurry displacement, Eccentric annulus, Mobility ratio, Bingham plastic.

Successful primary cementing of casing leaves no continuous channels of mud capable of flow during subsequent production. A study of the mechanics of mud displacement by cement slurry was made by means of analytical models and displacement experiments. Tendency of the cement to bypass mud is a function of the geometry of the annulus, the density and flow properties of the mud and the cement slurry, and the rate of flow. Bypassing can be prevented if the pressure gradient produced from circulation of the cement and by buoyant forces exceeds the pressure gradient necessary to drive the mud through the narrowest side of the annulus at the same velocity as the cement. Unless the cement slurry has greater density than the mud, the requirement to balance the pressures is to maintain the Bingham yield strength of the cement greater than the yield of the mud multiplied by the maximum distance from the casing to the wall of the borehole and divided by the minimum distance. Thinning a cement slurry can increase turbulent flow in an eccentric annulus but will reduce the efficiency of displacement. Rotation of the casing served to remove the channel of gelled mud that formed between the pipe and the nearby wall in very eccentric annuli. (Gray-NWWA)
W73-14703

RHEOLOGICAL DESIGN OF CEMENTING OPERATIONS,
Halliburton Services, Duncan, Okla.
K. A. Slagle.
Journal of Petroleum Technology, Vol 14, No 3, p 323-328, March, 1962. 2 fig, 2 tab, 10 ref.

Descriptors: *Cements, *Slurries, Hydraulics, *Viscosity, *Turbulent flow, Laminar flow, Reynolds number, Pozzolans, Bentonite, Diatomaceous earth, Non-Newtonian flow, Casings, Viscometers.
Identifiers: API Class A cement, Thixotropy, Fanning friction factor, Rotational viscometer, API RP10B, Hydraulic radius.

Laboratory measurements were made of flow properties of API class A cement slurries and of slurries containing the common cement additives. A multi-speed rotational viscometer was used. From a logarithmic plot of shear rate vs. shear stress, the flow-behavior index and the consistency index were determined. Average values of these factors and of the densities of the slurries are tabulated for samples of cement (API Class A) from seventeen sources. Examples are shown of the application of these properties in field operations to calculate flow rates, pressure drops, and critical velocities to approach turbulent flow in the casing-borehole annulus for several hole diameters. (Gray-NWWA)
W73-14705

A LIQUID FREON PERMEAMETER,
Socony Mobil Oil Co. Inc., Dallas Tex.
B. G. Hurd.
Society of Petroleum Engineers Journal, Vol 2, No 1, p 18-20, March, 1962. 2 fig.

Descriptors: *Permeability, *Permeameters, Rock properties, *Instrumentation, Darch's law, Flow, Porous media, Nitrogen.
Identifiers: *Freon, Dichlorodifluoromethane, Laboratory equipment.

The design of a liquid-Freon permeameter is shown schematically. It can be assembled from stock items of laboratory equipment. The method of use is described. The liquid-Freon permeameter retains the inherent accuracy of the liquid permeameter while affording the speed and ease of operation of the gas permeameter. Replicate measurements and comparison of results with those with conventional liquid and gas permeameters showed adequate precision up to 1000 md. The liquid-Freon permeameter is not recommended for permeabilities higher than 1000 md. (Gray-NWWA)
W73-14706

FAILURES IN THE BOTTOM JOINTS OF SURFACE AND INTERMEDIATE CASING STRINGS,
Atlantic Richfield Co., Dallas, Tex.
For primary bibliographic entry see Field 08G.
W73-14712

BURST RESISTANCE OF PIPE CEMENTED INTO THE EARTH,
Gulf Research and Development Co., Pittsburgh, Pa.
R. E. Zinkham, and R. J. Goodwin.
Journal of Petroleum Technology, Vol 14, No 9, p 1033-1040, September, 1962. 9 fig, 1 tab, 20 ref.

Descriptors: *Cements, *Well casings, *Tensile strength, *Compressive strength, Shear, Stress, Design data, Steel pipes, Casings, Strength of materials, Youngs modulus, Mathematical study.
Identifiers: *Burst resistance, *Casing design, Cement sheath, Mud filter cake, Hydraulic fracture.

A modification in casing design practices is proposed that could either reduce the amount and grade of steel required to contain a specified internal pressure, or allow the working pressure to be increased for a specified weight and grade of pipe. A mathematical study was made of the increased burst resistance a cement sheath would provide. Limiting assumptions were: (1) the pipe is completely surrounded by cement, and (2) any mud filter cake between the cement and the earth has the same physical properties as either the cement or the earth. Calculations showed that a cement sheath provides little or no support to the casing when the cement is unconfined or effectively stressed only in tension. When the cement is confined between the pipe and the earth and is loaded in compression, the pipe could receive a substantial amount of support. Data are shown in six charts. The potential usefulness of the cement sheath may be further increased by such downhole conditions as increased pressure, temperature, and confinement. The higher the modulus of elasticity for the cement sheath and the surrounding earth, the greater the amount of support they will give the pipe. (Gray-NWWA)
W73-14715

8G. Materials

REACTIONS AND TRANSPORT PHENOMENA AT SURFACES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 03A.
W73-14381

STRENGTHENING ROCK BY INJECTION OF CHEMICAL GROUT,
Corps of Engineers, Omaha, Nebr. Missouri River Div.
H. B. Erickson.
Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 94, No SM1, p 159-173, January 1968. 4 fig, 2 tab, 5 ref.

Descriptors: *Grouting, *Rock mechanics, Materials, Rock properties, Underground structures, *Stress, *Shear, *Resins, *Chemical grouting.
Identifiers: Epoxy resin grout, Polyester resin grout, Shear planes, Joints, Stress relief.

After any excavation of cohesive rock, the rock around the new opening contains the original fractures - joints, sheer planes and fractures - plus additional fractures caused by the stress relief inherent in the excavation process. If the openings are not immediately strengthened by some means, individual blocks of rock can rotate out of their original position and weaken the formation through the development of new fracture systems. This may possibly close off the excavation. If, however, the openings are filled with a chemical grout of the proper strength formation stability can be improved. Factors are presented which determine the feasibility of chemical grouting in field situations. Descriptions of equipment, types of grout and methods used for emplacement, and a field case study are also presented. (Smith-NWWA)
W73-14704

RHEOLOGICAL DESIGN OF CEMENTING OPERATIONS,
Halliburton Services, Duncan, Okla.
For primary bibliographic entry see Field 08F.
W73-14705

FAILURES IN THE BOTTOM JOINTS OF SURFACE AND INTERMEDIATE CASING STRINGS,
Atlantic Richfield Co., Dallas, Tex.
F. J. Schuh.
Journal of Petroleum Technology, Vol 20, No 1, p 93-101, January, 1968. 4 fig, 4 tab, 6 ref.

Descriptors: Casings, *Cement, Pipes, Wells, Rotary drilling, *Welded joints, Joints (Connections), Momentum transfer, Strength of materials, *Well casings.
Identifiers: *Casing failure, *Torque, Cementing plugs, Cementing equipment, Rotary speed, Drill collars, Thread-locking compounds, Pipe threads.

Failure in the bottom joints of casing can require expensive remedial action. Various possible causes of failure were examined. Failures are caused by high energy torque impulses delivered from the drill string while drilling the cementing plugs, cement, and float equipment from the bottom joints of the casing string. The magnitude of the torque impulse is a function of the drill string rotational momentum. Graphs show the minimum rotary speed and collar size required to unscrew casing without and with thread-locked couplings. Recommendations to eliminate failure are: (1) cement all casing strings with two plugs; (2) strengthen the three lowermost couplings joining the bottom four joints (six couplings on seven joints if a bottom plug cannot be used); (3) on J-55 or stronger casing and on all float equipment, clean all threads to be strengthened with suitable solvent before applying thread-locking compounds; (4) on H40 grade, strengthen the connections with a 1/4-inch fillet weld, and (5) limit rotary speed while drilling out cement to a safety factor of two between the torsional strength of the thread-locked joints and the maximum torque impulses of the bottom collars. (Gray-NWWA)
W73-14712

CATHODIC PROTECTION WORKS,
Harco Corp., Cleveland, Ohio.
H. W. Hosford.
Industrial Water Engineering, Vol 7, No 3, p. 33-34, March, 1970. 3 fig.

Descriptors: *Corrosion control, *Cathodic protection, Cathodes, Equipment, *Coatings, Metal pipes, Engineering structures, Resistivity.
Identifiers: *Stray current corrosion, *Galvanic corrosion, Coal-tar enamel coatings, Sacrificial anodes, Electrical bonding.

Cathodic protection is an electrical method of preventing corrosion. It works by making the metal surface to be protected a cathode of an electrochemical cell. By implication, cathodic protection principals can be used to prevent the corrosion of any metal. This is accomplished by directing an artificial, external current from a sacrificial anode to the cathodic pipe, which makes it impossible for the cathodic pipe itself to corrode. A discussion is presented of the basic types of corrosion and their causes, and the principals of cathodic protection in different corrosive environments with a very basic cost analysis. (Campbell-NWWA)
W73-14713

THE BOREHOLE TELEVIEWER--A NEW LOGGING CONCEPT FOR FRACTURE LOCATION AND OTHER TYPES OF BOREHOLE INSPECTION,
Mobil Research and Development Corp., Dallas, Tex.
J. Zemanex, R. L. Caldwell, E. E. Glenn, Jr., S. V. Holcomb, and L. J. Norton.
Journal of Petroleum Technology, Vol 21, No 6, p 762-774, June, 1969. 15 fig, 14 ref.

Descriptors: *Well logging, *Subsurface investigations, *Acoustics, *Well casings, *Fractures (Geologic), Electrical well logging, Rock properties, Faults (Geologic), Fissures (Geologic), Porosity, Limestone, Borehole cameras.
Identifiers: Fracture orientation, *Borehole television, Acoustic picture, Transducer, Magnetometer, Vugs, Permian formation, Indiced fracture, Casing inspection.

The Borehole Televiewer (BHTV) produces an acoustic picture in the form of a well log. The log, which is run continuously, can define both induced and natural fractures, and can show vuggy porosity, the size and distribution of perforations in casing, and casing failures. The basic method is as follows. A piezoelectric transducer probes the borehole wall with bursts of acoustic energy. Orientation of the log is provided from the earth's magnetic field by a flux-gate magnetometer. A motor rotates the transducer and magnetometer within the tool at about 3 revolutions per second. Appropriate electronic circuits process signals from the transducer and magnetometer for use at the surface. The borehole can be filled with any homogeneous gas-free liquid. The resulting log presents the borehole wall as if it were split vertically and laid flat. Any physical changes in the borehole wall appear as changes in picture intensity. Photographs and diagrams illustrate the operation of the device. Although the instrument is regarded as of greatest utility in the quantitative evaluation of natural and induced fractures where no other logging device is as effective; application to inspection of casing, location of vugs and washouts, identification of lithology, and determination of dip may be equally as significant. (Gray-NWWA)
W73-14721

FACTORS THAT AFFECT WELL LIFE,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W73-14723

SOME EFFECTS OF SIZE DISTRIBUTION ON PARTICLE BRIDGING IN LOST CIRCULATION AND FILTRATION TESTS,
Texas Univ., Austin.
For primary bibliographic entry see Field 08B.
W73-14726

A FIELD STREAMING-POTENTIAL EXPERIMENT,
Schlumberger Well Surveying Corp., Ridgefield, Conn.
M. Gondouin, H. J. Hill, and M. H. Waxman.
Journal of Petroleum Technology, Vol 14, No 3, p 305-312, March, 1962. 14 fig, 3 tab, 9 ref.

Descriptors: *Electric well logging, *Resistivity, *Drilling fluids, Logging (Recording), Subsurface investigations, Porous media, Shales, Sands, Pressure measuring instruments, Hydrostatic pressure.
Identifiers: *Streaming potential, Spontaneous potential, Induction log, Mud cake, Electrochemical potential.

Measurements were made in the borehole of the streaming-potential behavior of shales and mud cakes within the Muddy- and Dakota-sandstone interval of a Denver basin well. Pressure in these water-bearing sands is low (gradient 0.25 psi per foot) and they are separated by a shale interval of about 150 ft. A series of experiments was made in which the resistivity of the mud filtrate, the pressure in the borehole, and the logging equipment were varied. Streaming potentials opposite shales were of sufficient magnitude to be important in spontaneous potential interpretation. The shale streaming potentials were linearly dependent on the pressure differential and they increased with mud filtrate resistivity. Streaming potentials opposite sands were higher than those opposite shales when the mud was made with fresh water. The characteristics of the mud used in drilling the sand sections influenced the magnitude of the streaming potential at the time of logging, even though the mud used in drilling had been replaced by another mud before logging. Consequently, mud samples taken at the time of logging may not always be suitable for determining streaming potential corrections. Following a change in mud characteristics, several days were required for the spontaneous potential to stabilize. This effect was due in part to the mud cake acting as an imperfect shale membrane. (Gray-NWWA)
W73-14731

HYDRAULIC JETTING--SOME THEORETICAL AND EXPERIMENTAL RESULTS,
Gulf Research and Development Co., Pittsburgh, Pa.
J. L. Pekarek, D. K. Lowe, and J. L. Huitt.
Society of Petroleum Engineers Journal, Vol 3, No 2, p 101-112, June, 1963. 16 fig, 10 ref.

Descriptors: *Well casing, *Jets, Sand, Sandstone nozzles, Abrasive blasting.
Identifiers: Berea, *Hydraulic jetting, Well cleanout, *Jet perforating, Notch cutting, Casing perforation, Casing cutting.

The use of a fluid containing an abrasive material has been an established technique for cleaning and cutting in well casings for many years. The use of hydraulic jetting in well completion has become an accepted practice. A theoretical analysis of the mechanism of hydraulic jetting showed that the abrasive material exits from the jet nozzle at a lower velocity than the fluid. The exit particle velocity can be increased by increasing either the density of the fluid or the length of the nozzle and/or decreasing either particle density or particle diameter. There is a point in the divergent jet stream after which the particle velocity exceeds that of the fluid. An equation was derived to predict cutting rate of a circumferential notch and maximum notch depth. The theoretical predictions were substantiated by experimental results, using sand in water as the abrasive material. In addition, some studies were made of the effects of back pressure in the annulus; the distance between the nozzle exit and the casing; the rotational speed of the tool, and the concentration of the abrasive particles. (Campbell-NWWA)
W73-14733

8H. Rapid Excavation

LABORATORY STUDY OF SEICHING INDUCED ON AN OFFSHORE SHELF,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08B.
W73-14627

REFRACTION OF DISPERSIVE WAVES ON A BEACH,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08B.
W73-14628

EXPERIMENTAL TESTS OF A METHOD FOR DRILLING WITH EXPLOSIVES,
Esso Production Research Co., Houston, Tex.
L. H. Robinson.
Society of Petroleum Engineers Journal, Vol 5 No 2, p 153-159, June, 1965. 10 fig, 3 ref.

Descriptors: *Rotary drilling, *Explosives, *Drilling equipment, *Rock excavation, Craters, Drilling, Sandstones, Metamorphic rocks, Limestones.
Identifiers: *Shaped charges, Primacord, Detonator, Shock waves, Pentolite, Fracturing.

A proposed method of drilling utilizes sequential detonation of two types of explosive charges delivered to the hole by a conventional drilling fluid through pipe. A shaped charge first produces a long thin hole. A second charge, called a gauging charge, is pumped into the thin hole. The charge explodes and enlarges the hole to gauge. The proposed method was experimentally tested at the surface on 2-ft. cubes of Berea sandstone and on low-porosity (0.4%) metamorphic limestone. The test equipment is shown in diagrams and the results are illustrated by photographs. The proposed technique indicated a charge-to-rock removal ratio that would make the process feasible for drilling wells. A possible drilling sequence with modified rotary equipment is outlined. (Gray-NWWA)
W73-14719

8I. Fisheries Engineering

PARAMETRIC DETERMINATION OF MINIMUM STREAM FLOW FOR TROUT,
Wyoming Univ., Laramie. Water Resources Research Inst.
T. A. Wesche.
Available from the National Technical Information Service as PB-223 377, $4.25 in paper copy, $1.45 in microfiche. Water Resources Series No. 27, June 1973. 102 p, 40 fig, 6 tab, 27 ref. OWRR B-007-WYO (3).

Descriptors: *Trout, *Wyoming, Average flow, *Parametric hydrology, Brown trout, Aquatic habitats.
Identifiers: *North Platte River basin (Wyo), *Average daily flow, Trout cover.

The approach taken in the determination of a suitable minimum flow to be maintained in a stream channel for the preservation of trout populations has centered on three types of physical stream characteristics and the changes observed in them between various discharge levels, based on the average dialy flow (ADF) over the period of record: hydrologic parameters; surface areas and its composition, based on water depth and velocity; and available trout cover. Portions of Douglas Creek and Hog Park Creek, relatively small streams (average daily flows approximately 30 cubic feet per second) located in the North Platte River drainage of southeastern Wyoming, were intensively investigated in the summer and fall of 1972 at 200%, 100%, 50%, 25%, and 12.5% ADF. Water depth, velocity, cross-sectional area, wetted perimeter, hydraulic radius, top width, total surface area, surface area of depth 0.5 feet or greater, and available brown trout cover decrease at the greatest rate for the discharge reduction interval from 25% to 12.5% ADF. As a minimum flow, a discharge in the 25% ADF range will avoid the flow range for which the rate of habitat decrease is greatest.
W73-14213

HYBRIDIZATION IN THE ACIPENSERIDAE FAMILY AND PERSPECTIVE USE OF IT IN STURGEON FARMING, (IN RUSSIAN),
N. I. Nikolyukin.
Tr Vses Nauchno-Issled Inst Morsk Rybn Khoz Okeanogr. 76 p 56-69. 1970. (English Summary.

Identifiers: *Acipenseridae family, *Hybridization, *Sturgeon farming

The most interesting sturgeon hybrid is great sturgeon X sterlet. The first and the second generation from repeated crossing with the female great sturgeon is recommended for commercial production. The repeat hybrid differs from F1 by its faster growth with greater variability, which widens possibilities for slection. Fertility of the great sturgeon X sterlet opens possibilities for new forms with hereditary stability for both the pond and diadromous species. --Copyright 1972, Biological Abstracts, Inc
W73-14280

PUYALLUP HATCHERY POND AND PUMPING PLANT CONSTRUCTION,
Washington State Dept of Fisheries, Olympia
R. K. Jones
Available from NTIS, Springfield, Va 22151 as COM-72-11331. Price $3.00 printed copy; $1.45 microfiche. Contract Completion Report to NOAA, National Marine Fisheries Service, May 1972. 10 p, append

Descriptors: *Fish hatcheries, *Fish reproduction, *Engineering structures, *Salmon, *Washington, Ponds, Concrete construction, Asphalt, Fish migration, Costs, Fisheries
Identifiers: *Orting (Wash), *Puyallup Salmon Hatchery (Wash).

A construction program is described for the Puyallup Salmon Hatchery located on Voights Creek about 1.5 miles east of Orting, Washington. This project consisted of three jobs: (1) construction of four concrete ponds in accordance with Engineer-approved plans and specifications; (2) construction of two 1/4-acre ponds and related supply and drain lines in accordance with Engineer-approved plans and specifications; and (3) an existing rack and a fishway, pumping unit were reconstructed and supply lines were connected. The total cost of this project was $160,789.58 shared equally by the State and by the Federal Government. The additional ponds and water supply should increase production of the Puyallup Hatchery by 57,000 pounds of salmon. (Woodard-USGS)
W73-14357

ELK RIVER SALMON HATCHERY EXPANSION,
Oregon Fish Commission, Portland.
E. K. Neubauer.
Available from the National Technical Information Service as COM-72 11071. National Marine Fisheries Service, Completion Report Project No AFC-59, March 1972. 4 p. NMFS project AFC-59, Contract 14-17-0001-2338.

Descriptors: *Construction costs, *Salmon, *Fish hatcheries, Design, *Oregon.
Identifiers: *Elk River (Ore.), Hatchery expansion.

A final summary of the expansion of the Elk River Salmon Hatchery's rearing capacity from 1 million to 1.7 million smolts is presented. The estimated project cost of $228,000 was equally shared by the Oregon Fish Commission and the National Marine Fisheries Service. The Commission's Division of Engineering was responsible for design and contract document preparation. Because initial bids received on July 31, 1970 exceeded the available funds, the design was altered and new bids were called. The contract was awarded to Richard L. Mertin, Inc. on March 29, 1971 for the low bid of $186,708. Construction began April 5 and proceeded according to contract requirements with no unusual delays or other problems. Three Change Orders were issued during construction which called for quality of material improvements, thus raising the final general contract cost to $206,760. Final inspection on December 13, 1971

found all work complete and acceptable. After purchase of 22 16-tray incubators and a minor test fee, the project closed with an unexpended balance of $6,656. (Weaver-Wisconsin)
W73-14519

DESIGN FOR FUTURE PROGRAM CONSTRUCTION,
Washington State Dept. of Fisheries, Olympia. Engineering and Construction Div.
R. K. Jones.
Available from the National Technical Information Service as COM-72 11070. National Marine Fisheries Service, Completion Report Project AFC-40, February 1972. 7 fig.

Descriptors: *Fish handling facilities, *Estimated costs, *Project planning, *Design, Fish hatcheries, *Washington.
Identifiers: Hood Canal (Wash).

Plans, specifications, and cost estimates for ten individual projects for a fish handling facility involving water supply, holding ponds, pumping and trap, and fishway improvements in Washington State are listed. All designs were prepared with design criteria established by the Hatchery Division of the Washington Dept. of Fisheries. Changes in program priorities for investment which occurred and affected achievement of initial project goals are enumerated. These included changes in over-all investment priorities necessitating suspension of work on yet uncompleted projects and changes in project scale. Completed general plans and project layouts are included. (Weaver-Wisconsin)
W73-14522

EFFECT OF FISH REMOVAL ON THE GROWTH AND CONDITION OF WHITE SHRIMP, PENAEUS SETIFEROUS (LINNAEUS), IN BRACKISH PONDS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 02L.
W73-14587

DEPURATION OF BILOXI BAY OYSTERS BY RELAYING,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 05C.
W73-14593

CASCADE RIVER STREAM IMPROVEMENT,
Washington State Dept. of Fisheries, Olymphia.
R. W. Kramer.
Available from NTIS, Springfield, Va 22151 as COM-72-11101 Price $3.00, printed copy; $1.45 microfiche. Project Completion Report to NOAA, National Marine Fisheries Service, October 1969. 7 p, 8 photo.

Descriptors: *Fish passages, *Salmon, *Stream improvement, *Fish management, *Washington, Channel improvement, River training, Engineering, Boulders, Explosives, Fish migration, Anadromous fish, Chinook salmon, *Washington.
Identifiers: *Cascade River (Wash), Skagit County (Wash).

Boulders and ledges in the bed of the Cascade River, Skagit County, Washington, were altered to widen the stream channel and reduce the gradient to enhance passage of chinook and coho salmon. Drilling and blasting of one large granite boulder, ledges and other rock leveled the area to existing water surface or lower, thereby widening the stream channel and reducing the abrupt gradient to provide easier fish passage. Observations have been made periodically of the work area to determine passage conditions at various streamflows. Some of the blasted rock remains in the stream channel but it does not hinder migration. (Woodard-USGS)
W73-14594

ESTIMATION OF ROTENONE CONCENTRATION BY BIOASSAY,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
H. A. Loeb, and R. Engstrom-Heg.
N Y Fish Game J, Vol 18, No 2, p 129-134, 1971, Illus.
Identifiers: *Bioassay, Fishery management, *Rotenone, Salmo-trutta, *Brown trout.

Concentration-response curves were determined for brown trout (Salmo trutta) placed in water dispersions of emulsifiable rotenone. The response measured was loss of equilibrium. The values obtained yielded linear plots on logarithmic paper, when estimated threshold values were subtracted from the concentrations and response times. Linear plots were also obtained by plotting reciprocals of response times against logarithms of concentrations, using semi-logarithmic paper. The intercept of the regression line with the log concentration axis is an estimate of the threshold concentration. The curves obtained have proved to be reliable indicators of residual rotenone concentrations, particularly within the 0.05 to 0.3 ppm concentration range.--Copyright 1973, Biological Abstracts, Inc.
W73-14741

RECOLONIZATION OF A ROTENONE--TREATED SEGMENT OF THE TEN MILE RIVER,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
R. Engstrom-Heg, and H. A. Loeb.
N Y Fish Game J, Vol 18, No 2, p 135-138, 1971.
Identifiers: American eel, Biomass (Fish), Eel, Fish populations, Rivers, *Rotenone, *New York (Ten Mile River), *Recolonization (Fish).

Recolonization of the upstream 500 ft of a 2100-ft rotenone-treated section of the Ten Mile River was studied over a 10-mo. period. At the end of the period, the fish population and fish biomass were estimated as 69.2 and 32.1% of their respective pretreatment values. Immigrant fish of most species tended to be smaller and younger than fish of the same species in the pretreatment population. A notable exception was the American eel, the species contributing most to the fish biomass.--Copyright 1973, Biological Abstracts, Inc.
W73-14742

EFFECTS OF CONTROLLED FLOW REDUCTION ON A TROUT STREAM,
Alberta Dept. of Lands and Forests, Red Deer. Fish and Wildlife Div.
M. E. Kraft.
J Fish Res Board Can, Vol 29, No 10, p 1405-1411, 1972, Illus.
Identifiers: Controlled flow, Movements (Fish), Streams, Tag, *Trout, *Montana (Blacktail Creek).

The total number of brook trout age I and older in 3 runs of Blacktail Creek, Montana, was reduced approximately 62% when 90% of the normal flow was diverted for about 3 mo., in comparison with 20% for runs in control sections. Both number and weight of trout in pools of the test sections generally increased, whereas those in control pools decreased. Recaptures of tagged trout also indicated movements from runs to pools in the test sections, but not in the control sections. When the flow was reduced 75% or less, there were no consistent changes in number or weight of trout in the test runs and pools, whereas those in the control sections were more marked though also inconsistent. Reduced flows had no consistent effect on the number of underyearlings. The changes in most physical characteristics after 90% flow reduction were considerably less than the degree of reduction, presumably because the stream flowed in a well defined channel. Surface area and average depth were least affected (about 42% decrease) and current velocity (75%) the most. Fast-water portions (current velocity over 0.30 m/sec) comprised over 60% of the surface area at normal flows and slow water portions over 85% of the area when the flow was reduced 90%. A multiple linear regression with the physical characteristics as independent variables and the number of trout as the dependent variable accounted for over 75% of the variation in the number of age I and older trout in runs and pools.--Copyright 1973, Biological Abstracts, Inc.
W73-14745

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

NEBRASKA WATER RESOURCES RESEARCH INSTITUTE - PAST, PRESENT AND FUTURE.
Nebraska Univ., Lincoln. Water Resources Research Inst.

Available from the National Technical Information Service as PB-223 374, $2.75 in paper copy, $1.45 in microfiche. Publication No 9, March 1973. 16 p. OWRR A-999-NEB (12). 14-31-0001-3827.

Descriptors: *Education, *Training, *Water resources, Insitute, Universities, Colleges, *Research and development.
Identifiers: Technology transfer.

A brief report is presented of the Nebraska Institute's activities and prospects for the future. Research, technology transfer and education and training are described.
W73-14209

INVENTORY OF WATER RESOURCES CONDUCTED IN MINNESOTA 1963 THROUGH 1972,
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 09D.
W73-14366

WATER RESOURCES CENTER ANNUAL REPORT, 1 JULY 1971 - 30 JUNE 1972.
California Univ., Davis. Water Resources Center.

Available from the National Technical Information Service as PB-223 564, $9.00 in paper copy, $1.45 in microfiche. Report No. 25, January, 1973. 133 p. OWRR A-999-CAL (7).

Descriptors: *California, *Water resources institute, Training, Education, Universities, *Research, Projects.

The annual activity is summarized of the sponsored research program of the Water Resources Center of the University of California. Summary reports of individual research projects are presented together with statement of publications available from each project. Projects covered include those financed by the State of California and by the Office of Water Resources Research of the U. S. Department of Interior under Title I of PL 88-379. Also included is a summary of the information dissemination program of the California Water Resources Center and other activities relevent to development of the overall program.
W73-14370

9D. Grants, Contracts, and Research Act Allotments

INVENTORY OF WATER RESOURCES CONDUCTED IN MINNESOTA 1963 THROUGH 1972,
Minnesota Univ., St. Paul. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service as PB-223 432, $7.25 in paper copy, $1.45 in microfiche. Bulletin 65. August 1973. 95 p, 7 tab. OWRR A-028-MINN (2).

Descriptors: *Water resources, *Research, *Minnesota, Manpower, *Universities, Training, Education, *Federal government, *Projects, Industries, Utilities.

Total annual water resource research effort in Minnesota in terms of number of ongoing projects increased from 65 in 1963 to 149 in 1971 and was 140 in 1972. The estimated annual man-years of effort rose from 41.1 in 1963 to 200.1 in 1972. Total annual expenditures increased from $620,000 in 1963 to $3,900,000 in 1972. In 1972, Federal agencies conducted the greatest amount (50 percent of total) of water resources research in Minnesota with the University of Minnesota, Consultant, Private Organizations, State and Private Colleges and State agencies following in that order. The percentages of the total research conducted by individual Federal agencies were as follows: Environmental Protection Agency (National Water Quality Laboratory) - 42, U. S. Department of Agriculture (Agricultural Research Service) - 4, U. S. Department of Agriculture (Forest Service) - 2, and U. S. Department of the Interior (Geological Survey) - 2. Organizations funding the greatest amounts of water resources research in 1972 were: Environmental Protection Agency, U. S. Department of the Interior, U. S. Department of Agriculture, U. S. Department of Navy, National Science Foundation, Atomic Energy Commission, Northern States Power Company, Department of Defense and State agencies.
W73-14366

WATER RESOURCES CENTER ANNUAL REPORT, 1 JULY 1971 - 30 JUNE 1972.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 09A.
W73-14370

THE NATURE OF CHEMISTRY IN THE NATIONAL SEA GRANT PROGRAM,
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 02K.
W73-14397

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10A. Acquisition And Processing

RESEARCH FOR APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENTS (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 07C.
W73-14349

10F. Preparation of Reviews

A SELECTED ANNOTATED BIBLIOGRAPHY ON WATER RESOURCES OF THE STATE OF WASHINGTON.
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 02E.
W73-14201

A SELECTED ANNOTATED BIBLIOGRAPHY ON COLUMBIA AND SNAKE RIVERS.
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 02E.
W73-14202

EFFECTS OF POLLUTION ON FRESHWATER FISH,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 05C.
W73-14259

MICROBIOLOGY OF WATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 05B.
W73-14260

MICROBIOLOGY OF WASTE TREATMENT,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 05D.
W73-14261

MICROBIOLOGY - WATERBORNE OUTBREAKS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05C.
W73-14262

MICROBIOLOGY-DETECTION OF BACTERIAL PATHOGENS AND THEIR OCCURRENCE,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W73-14263

MICROBIOLOGY-DETECTION AND OCCURRENCE OF VIRUSES,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
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AQUATIC SEDIMENTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05C.
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MARINE AND ESTUARINE POLLUTION,
California State Univ., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 05B.
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HEAVY METALS: A REVIEW OF LEAD,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 05B.
W73-14267

THERMAL EFFECTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W73-14268

EUTROPHICATION,
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For primary bibliographic entry see Field 05C.
W73-14269

FRESHWATER MACROINVERTEBRATES,
National Field Investigations Center, Denver, Colo.
For primary bibliographic entry see Field 05C.
W73-14270

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For primary bibliographic entry see Field 05A.
W73-14316

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Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05A.
W73-14317

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Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05A.
W73-14318

DETERGENTS,
Matz, Childs, and Associates, Baltimore, Md.
For primary bibliographic entry see Field 05B.
W73-14319

ADVANCES IN NEAR-SHORE PHYSICAL SEDIMENTOLOGY: A SELECTIVE REVIEW,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-14572

SELECTED BIBLIOGRAPHY ON LABORATORY AND FIELD METHODS IN GROUND WATER HYDROLOGY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 24
DECEMBER 15, 1973

W73-14751 -- W73-15300

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

RAMAN SPECTRA AND STRUCTURE OF WATER IN DIMETHYL SULFOXIDE,
Western Regional Research Lab., Berkeley, Calif.
J. R. Scherer, M. K. Go, and S. Kint.
Journal of Physical Chemistry, Vol 77, No 17, p 2108-2117, Aug 16, 1973. 15 fig, 2 tab, 46 ref.

Descriptors: *Spectroscopy, *Sulfur compounds, *Water structure, *Molecular structure, Water properties, Water, Hydrogen bonding, Structural models, Resonance, Heavy water, Water types, Temperature.
Identifiers: *Raman spectra, Dimethyl sulfoxide, Symmetry, Mixtures, Hydroxyl groups.

A simple model is proposed for the structure of liquid water that explains the concentration and temperature dependence of the Ramam spectra of water in mixtures with dimethyl sulfoxide. The model proposes two states for a hydrogen-bonded water molecule. One state involves a symmetrically, the other state an asymmetrically H-bonded species. The symmetric molecule exhibits a symmetric OH stretching vibration that is infrared and Raman-active plus an antisymmetric OH stretching vibration that is active in the IR and anisotropic Raman spectra but forbidden in the isotropic Raman spectrum. The asymmetric molecule has two OH stretching vibrations of which one involves the H-bonded OH, and the other the weakly H-bonded OH. Fermi resonance with the overtone of the bending vibration is shown to affect the spectra of both the symmetric and the antisymmetric OH stretching vibrations. The resonance constants for liquid water and heavy water (deuterium oxide) agree with vapor-phase results. A questionable third state involving two weak H bonds is proposed to account for weak scattering in the high-frequency region that is not explicable by the two-state model. The change in depolarization ratio across the OH stretching region is readily understood in terms of this model and agrees well with corresponding data for HOD. (Brown-IPC)
W73-14939

EQUILIBRIUM CONCEPTS IN NATURAL WATER SYSTEMS.
American Chemical Society, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-15190

02. WATER CYCLE

2A. General

ANALYSIS OF MULTIPLE-INPUT STOCHASTIC HYDROLOGIC SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. T. Chow.
Available from the National Technical Information Service as PB-223 870, $3.75 in paper copy, $1.45 in microfiche. Illinois University Water Resources Center Research Report No 67, July 1973. 66 p, 18 fig, 3 tab, 10 ref, appendix. OWRR B-038-ILL (10).

Descriptors: *Hydrology, *Watersheds (Basins), *Systems analysis, *Hydrologic systems, Model studies, Stochastic processes, Synthetic hydrology, Watershed management, Streamflow forecasting, *Illinois.
Identifiers: *Sangamon River basin (Ill).

The development of a multiple-input stochastic hydrologic system model is described for the analysis of hydrologic behavior of watersheds. Various components of the hydrologic system are expressed by time series, each containing a trend component, a periodic component and a stochastic residual component. For modeling the multiple-input system, a Markov-type mathematical formulation is proposed. For illustrative purposes, the model is applied to the analysis of monthly precipitations and streamflows of the upper Sangamon River basin in Illinois. The results indicate that the proposed model is feasible for the basin and thus can be used for filling missing streamflow data or generating stochastic streamflow sequences. (Woodard-USGS)
W73-14753

SIMULATION OF THE QUANTITY AND QUALITY OF FLOW IN A RIVER BASIN,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
C. C. S. Song, A. F. Pabst, and C. E. Bowers.
Available from the National Technical Information Service as PB-223 964, $3.75 in paper copy, $1.45 in microfiche. Project Report No. 145, June 1973. 34 p, 25 fig, 3 tab, 19 ref. OWRR A-024-MINN (1).

Descriptors: *Mathematical models, *Systems analysis, Water quality, *River basins, *Minnesota, *Simulation analysis, Model studies, River flow, Synthetic hydrology.
Identifiers: Water quantity.

The objective was the simulation of the quantity and quality of flow in a fairly large basin on a continuous synthesis basis. An existing mathematical model was modified slightly and fitted to the 16,200 square mile Minnesota River Basin. The model used was the SSARR (Streamflow Synthesis and Reservoir Regulation) model developed by the Corps of Engineers and the National Weather Service for the Columbia Basin. A stochastic water quality model was developed and fitted to portions of the Minnesota Basin for use with the quantity model. A deterministic water quality model was written for the main stem of the Minnesota River. Preliminary results using water temperature data show good agreement with measured data. (Walton-Minnesota)
W73-14765

QUANTITATIVE HYDROLOGIC STUDY OF A CLOSED BASIN WITH A PLAYA (ESTANCIA VALLEY, NEW MEXICO),
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
B. E. DeBrine.
Available from the National Technical Information Service as PB-223 928, $11.00 in paper copy, $1.45 in microfiche. PhD Desertation May 1971, 165 p, 12 tab, 26 fig, 4 plates, 1 append, 42 ref. OWRR B-005-NMEX (2).

Descriptors: *New Mexico, *Playas, *Water budget, Hydrology, *Groundwater flow, Darcy's Law, Pumping, Evaporation, Aquifers, Hydrogeology, Aquifer testing, Precipitation (Atmospheric), Water level fluctuations, Drawdown, Evaporation pans, Climatic data, Inflow, *River basins, Computer programs.
Identifiers: *Estancia Valley (N Mex), Potential evaporation.

Few quantitative hydrologic studies of closed basins discharging ground water through playa systems have been made. A water budget was determined for a small test area of the Estancia Valley in central New Mexico which offers a unique, highly saline, perennially moist, environment in its playa discharge region. Ground water inflow was determined by Darcy's Law in the form: Q = TIL, using the results of several aquifer tests and water level data from a well monitoring program. Evaporative discharge was determined from climatic data, collected at a weather station located on a playa near the test area, utilizing several existing techniques. These techniques were modified and adapted to fit the unique conditions of the Estancia playas. Computer programs were developed to process the climatic data. The results show that between 340 and 455 acre-feet of ground water is discharged by evaporation in the test area each year. Extending these results to the entire Estancia system shows that between 27,000 and 36,000 acre-feet of ground water is discharged annually by the playas. (Creel-New Mexico)
W73-14767

HYDROLOGY OF SEASONALLY INUNDATED AFRICAN HEADWATER SWAMPS,
National Council for Scientific Research, Lusaka (Zambia). Water Resources Unit.
J. Balek, and J. E. Perry.
Journal of Hydrology, Vol 19, No 3, p 227-249, July 1973. 10 fig, 8 tab, 11 ref.

Descriptors: *Water balance, *Swamps, *Rainfall-runoff relationships, Water storage, Water yield, Runoff, Streamflow, Wetlands, *Africa, Seepage, Surface-groundwater relationships, Base flow.
Identifiers: *Dambos.

African seasonally inundated headwater swamps (dambos) play a very important role in the African natural resources economy because they act as storage reservoirs absorbing water during the rainy season and giving it up slowly during the dry season. The hydrological response of the catchment to the precipitation depends on the size of the dambo area within a catchment; from a higher percentage of dambo area, a higher surface runoff volume occurs. Surface runoff forms the largest part of the total runoff in all the catchments containing a dambo. The duration of the surface runoff as compared with a nonswampy area of similar shape and size is delayed by the resistance of dambo grasses to the flow. The dambos are recharged shortly after the rainly season starts and release the water within a constant time interval after the last heavy storm. The length of the interval depends on the soil type forming the dambo and on the slope. Groundwater storage in the catchments is depleted more by evapotranspiration than by the base flow. The evapotranspiration by the woodland is approximately three times higher than the evapotransporation by the dambo grasses. Only a part of the woodland area contributes toward the formation, of the hydrograph during a period, the length of which depends upon the mean groundwater level at the end of the rainy season. (Knapp-USGS)
W73-14825

RAINFALL EXCESS MODEL FROM SOIL WATER FLOW THEORY,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02G.
W73-14836

LOG-NORMAL STREAMFLOW GENERATION MODELS REEXAMINED,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
G. P. Codner, and T. A. McMahon.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 10002, p 1421-1431, September 1973. 5 tab, 15 ref, append.

Descriptors: *Synthetic hydrology, *Simulation analysis, *Streamflow forecasting, Statistical methods, Markov processes, Stochastic processes, Mathematical models, *Water storage, Water yield, *Australia, Model studies.

Data from several Australian rivers were used to examine three monthly log-normal streamflow generation models. The first model is based on Fiering's skewed transformation equations which are applied to logs of monthly flows. The other two models are based on two- and three-parameter log-normal distributions using moment transformation equations. Some deficiencies were noted in three procedures for computing storage size--the behavior approach, the sequent peak method and Gould's storage analysis. Length and number of traces were also studied. Large implied skew in the two-parameter model results in lower storage estimates than those found from the three-parameter model. Errors in the historical mean are more significant in relation to storage estimates than errors in serial correlation. The number of traces generated need only be sufficient to define storage mean and to indicate variability. (Knapp-USGS)
W73-14838

CALCULATION OF ITEMS IN THE WATER BALANCE OF THE ATMOSPHERE AND HYDROSPHERE (O RASCHETE ELEMENTOV VODNOGO BALANSA ATMOSFERY I GIDROSFERY),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
G. P. Kalinin, and L. P. Kuznetsova.
Vodnyye Resursy, No 1, p 15-31, 1972. 5 fig, 5 tab, 17 ref.

Descriptors: *Water balance, *Hydrologic cycle, *Atmosphere, *Water vapor, Precipitation (Atmospheric), Runoff, Evaporation, Monthly, Seasonal, Maps, Equations.
Identifiers: USSR, *Hydrosphere, Aerology.

The expediency of a common solution of water-balance equations for the atmosphere and hydrosphere is demonstrated. Global characteristics of principal components of the hydrologic cycle (precipitation, runoff, evaporation) are tabulated, and net water-vapor fluxes across the USSR are tabulated and mapped on the basis of observation data obtained from 66 aerological stations in 1957-64. (Josefson-USGS)
W73-14847

CHARACTERISTICS OF THE HYDROLOGIC CYCLE IN THE ATMOSPHERE AND POSSIBILITIES OF A LONG-TERM FORECAST OF CHANGES (ZAKONOMERNOSTI VLAGOOBOROTA V ATMOSFERE I VOZMOZHNOSTI DOLGOSROCHNOGO PREDSKAZANIYA YEGO IZMENENIY),
Main Geophysical Observatory, Leningrad (USSR).
For primary bibliographic entry see Field 02B.
W73-14848

INTERNATIONAL COOPERATION IN HYDROLOGY (MEZHDUNARODNOYE SOTRUDNICHESTVO V OBLASTI GIDROLOGII),
Hydrometeorological Service of the USSR, (Moscow).
For primary bibliographic entry see Field 06E.
W73-14855

CONFERENCE ON THE HYDROLOGIC CYCLE IN NATURE AND ITS ROLE IN FORMATION OF FRESHWATER RESOURCES (SOVESHCHANIYE PO PROBLEME 'VLAGOOBOROT V PRIRODE I YEGO ROL' V FORMIROVANII RESURSOV PRESNYKH VOD'),
L. P. Kuznetsova, and Yu. V. Kurilova.
Vodnyye Resursy, No 2, p 197-199, 1972.

Descriptors: *Conferences, *Hydrologic cycle, *Water resources, *Freshwater, Surface waters, Hydrology, Meteorology, Satellites (Artificial), Isotope studies.
Identifiers: *USSR, Water exchange.

An All-Union conference devoted to the hydrologic cycle and its role in formation of freshwater resources and organized by the USSR Academy of Science's Institute of Water Problems was held in Moscow January 10-13, 1972. Participants in the conference included 170 specialists from 40 Soviety scientific research institutes and universities as well as scientists from socialist countries. Of the 24 papers presented, 13 were from institutes of water problems, atmospheric physics, and geography of the USSR Academy of Sciences and 11 from institutes of the Hydrometeorological Service and Leningrad State University. Major topics examined were problems of the hydrologic cycle and surface waters. Of particular interest were papers devoted to methods of investigation of certain hydrological and meteorological phenomena by artificial earth satellites and natural isotopes. Main trends in investigations of problems on water exchange in nature were outlined. (Josefson-USGS)
W73-15013

SOVIET NATIONAL COMMITTEE OF THE INTERNATIONAL ASSOCIATION FOR HYDRAULIC RESEARCH (SOVETSKIY NATSIONAL'NYY KOMITET MEZHDUNARODNOY ASSOTSIATSII PO GIDRAVLICHESKIM ISSLEDOVANIYAM),
M. F. Skladnev, and K. A. Zvorykin.
Vodnyye Resursy, No 2, p 199-201, 1972.

Descriptors: *Organizations, *Hydraulics, *Hydraulic structures, Conferences.
Identifiers: *USSR.

The International Association for Hydraulic Research (IAHR) was founded to stimulate and develop theoretical, experimental, and applied hydraulic research through publication and organization of international congresses, symposia, seminars, and regional meetings devoted to current problems in modern hydraulics. In the Soviet Union all activities associated with IAHR are carried out through the Soviet National Committee (SNC) of the Assoication. The Committee is governed by a presidium consisting of a chairman, 3 deputy chairmen, and a secretary and includes 41 specialists from 29 Soviet organizations engaged in hydraulic research. Eight technical committees have been organized by SNC to study theoretical principles of hydraulics; conveyance structures; hydraulic machinery, equipment, and cavitation; ice problems; river hydraulics; polyphase fluids; marine and coastal hydraulics; and infiltration. A ninth technical committee on water-management systems is planned. (Josefson-USGS)
W73-15014

FOURTH ALL-UNION HYDROLOGY CONGRESS (IV VSESOYUZNYY GIDROLOGICHESKIY S'YEZD),
V. Zakharov.
Vodnyye Resursy, No 2, p 201-202, 1972.

Descriptors: *Conferences, *Hydrology, Water balance, Runoff, Forecasting, Surface-groundwater relationships.
Identifiers: *USSR.

On the suggestion of the Main Administration of the Hydrometeorological Service, a Fourth All-Union Hydrology Congress will be held in Leningrad in October 1973 to assess the status of hydrologic studies in the USSR and to discuss major problems in the development of hydrology. Nine panels will be set up to discuss water balance and runoff computations; hydrologic problems of water management; hydrologic forecasts; surface-groundwater relationships; hydrology of lakes, reservoirs, and estuaries; water quality and scientific principles of water conservation; channel processes; hydrometry and water control; and hydrophysics. Approximately 20 papers will be discussed by each panel. (Josefson-USGS)
W73-15015

TWENTY-FIFTH HYDROCHEMISTRY CONFERENCE (XXV GIDROKHIMICHESKOYE SOVESHCHANIYE),
V I Popov
Vodnyye Resursy, No 2, p 203, 1972.

Descriptors: *Conferences, *Water chemistry, *Water quality, *Water pollution, *Self-purification, Surface waters, Water analysis
Identifiers: *USSR

The Twenty-Fifth Hydrochemistry Conference, organized by the Hydrochemical Institute of the Main Administration of the Hydrometeorological Service and devoted to the problem 'Status and Prospects of Development of Studies on Pollution and Self-Purification of Surface Waters of Land Areas,' was held in Novocherkassk, May 16-19, 1972. Conference participants included scientific workers and specialists from institutes in Novocherkassk, Moscow, Leningrad, Kiev, Tallin, Petrozavodsk, Perm', Tartu, Alma-Ata, Sochi, and other cities. The 32 papers of the conference dealt with problems of pollution and self-purification of water bodies; forecasts of water quality of rivers and reservoirs; methods of water-quality evaluation; and automation in monitoring chemical composition of surface waters. Following the conference, a symposium was held at which 12 papers on techniques of water chemical analysis were presented. (Josefson-USGS)
W73-15016

RELATIONSHIP OF OBSERVED RAINFALL AND RUNOFF RECURRENCE INTERVALS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
C. L. Larson, and B. M. Reich.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 34-43, 1973. 3 fig, 2 tab, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Design flow, *Design storm, Frequency analysis, Flood recurrence interval, Statistics, Statistical methods.

For most small watersheds, design runoff must be predicted by parametric methods which utilize generalized rainfall data and the physical characteristics of the watersheds. Implicit in these methods is the assumption that the recurrence interval of runoff is equal to that of the rainfall. Peak flows from 20 small watersheds in Pennsylvania for periods of 11 to 30 years were analyzed along with maximum storm rainfall amounts. For individual years, the runoff and rainfall ranks were seldom equal. However, the runoff rank exceeds the rainfall rank with about the same frequency that the rainfall rank exceeds the runoff rank. Despite high variability for individual years, storm rainfall and runoff rank and recurrence interval have a distinct central tendency toward being equal. Thus, for design purposes, the assumption of equality is justified and appropriate. (Knapp-USGS)
W73-15032

THE ROLE OF LAG IN A QUASI-LINEAR ANALYSIS OF THE SURFACE RUNOFF SYSTEM,
Technion - Israel Inst. of Tech., Haifa.
M. H. Diskin.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 133-144, 1973. 4 fig, 10 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Time lag, Systems analy-

sis, Variability, Unit hydrographs, Input-output analysis.

The surface runoff system, defined in terms of rainfall excess as its input and direct surface runoff as its output, is considered to be nonlinear. Its departure from linearity is however not large as is evident from the fairly successful results by the use of linear models. This fact leads to the idea of developing a quasi-linear approach in modeling. The linear convolution integral is assumed to represent the rainfall-runoff relationship during any one storm, but the kernel function (or IUH) is taken to be different for various storms. The changes in the shape of the kernel function may be described in terms of the variations in the value of the lag, defined as the time difference between centroids of input and output. Using the lag as a basis for the dimensionless plotting of the kernel function leads to a curve that is nearly constant for all storm events in a given watershed. It is possible to obtain a good fit to observed floods and to predict future floods. (Knapp-USGS)
W73-15037

ANALYSIS OF UNITGRAPH METHOD OF FLOOD SYNTHESIS BY SHALLOW WATER EQUATIONS,
Geneva Coll., Beaver Falls, Pa. Dept. of Engineering.
C. A. Givler.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 145-156, 1973. 4 fig, 6 ref.

Descriptors: *Unit hydrographs, *Hydrograph analysis, *Rainfall-runoff relationships, Model studies, Mathematical models, Peak discharge, Streamflow forecasting, Flood forecasting.

The rainfall excess-surface runoff process was simulated by a deterministic watershed model consisting of a plane and channel. A numerical solution of the one-dimensional shallow water equations describes both plane and channel flows. The relationship between rainfall excess and surface runoff is nonlinear, with the degree of nonlinearity varying throughout the extent of the hydrograph. Because of nonlinearity, a watershed has no unique unitgraph. The unitgraph peak is proportional to the 0.40 power of input intensity and the -0.38 power of time to peak. The recorded unitgraph is obtained directly from simple streamflow records, while the derived unitgraph is calculated from complex events with the superposition principle. For simulating floods the derived unitgraph tends to be more accurate because it inherits a bias toward the superposition principle. The unitgraph can lead to serious errors in flood simulation. It is recommended that the standard unitgraph method be refined by the unitgraph adjustment technique and the multiple unitgraph technique. (Knapp-USGS)
W73-15038

DEMONSTRATION OF NONLINEAR EFFECTS OF A SECOND ORDER SURFACE RUNOFF MODEL BY FIELD DATA,
Armament Development Authority, Haifa (Israel).
A. Boneh, and M. H. Diskin.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 157-166, 1973. 4 fig, 7 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, Unit hydrographs, Peak discharge.
Identifiers: Volterra series.

Indications of nonlinear behavior of watersheds are common analyses of rainfall and runoff data, especially from small watersheds. Unit hydrographs derived from storms of higher intensity (for the same short duration) have a higher peak and a shorter time to peak. A useful nonlinear representation of the rainfall-runoff relationship is a second order Volterra series. The second order model is characterized by two kernel functions that specify the system considered. Some properties of the two kernel functions may be derived from the nature and definition of the surface runoff system. Other properties are consequences of the behavior of small watersheds. (Knapp-USGS)
W73-15039

LONG TERM RUNOFF ANALYSIS BY A CONCEPTUAL PHYSICAL MODEL,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
M. Kadoya, and Y. Hayas.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 200-212, 1973. 8 fig, 4 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Hydrograph analysis, Base flow, Time lag, Recharge, Subsurface runoff, Systems analysis, Flood forecasting, Runoff forecasting.
Identifiers: Kinematic wave theory.

Simulating the long-term runoff hydrograph at the outlet of a watershed by a simple method is based on the assumption that long-term runoff phenomena are the combination of repetitions of short-term runoff and addition of groundwater flow with a long time-constant. These may be simulated by adopting theoretical models combining all the other short- and long-term runoff models. Three conceptual models were constructed considering the physical mechanism of the runoff phenomena: (1) the recharge capacity model for groundwater runoff and rainfall loss for direct runoff; (2) the interflow model for the flow in porous media on the surface of slope; and (3) the kinematic wave model for overland flow. The usefulness of combining the models using theoretical relationships between them is emphasized through an applied example. (Knapp-USGS)
W73-15042

STOCHASTIC MODEL OF FLOOD RISK EVALUATION,
West Virginia Inst. of Tech., Montgomery. Dept. of Civil Engineering.
A. S. Paintal.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 343-348, 1973. 4 ref.

Descriptors: *Statistical models, *Flood forecasting, *Risks, Probability, Stochastic processes, Design flood, Design flow, Peak discharge.

A stochastic model is given for use in making hydrologic decisions involving floods. The flood events (in excess of given magnitude) occurring along the time axis are assumed to be independent of each other. The distribution function of damage caused by a given flood is a negative exponential. A mathematical expression for the density function of total damage during the life of structure is based on the theory of sums of a random number of random variables and on Bayesian probability concepts. (Knapp-USGS)
W73-15054

MODEL FOR CALCULATING FLOODS IN URBANIZED WATERSHEDS,
Technische Hochschule, Brunswick (West Germany).
For primary bibliographic entry see Field 04C.
W73-15060

SIGNIFICANCE OF THE GENESIS OF FLOODS ON PROBABILITY ANALYSIS,
Ebasco Services, Inc., New York.
For primary bibliographic entry see Field 02E.
W73-15062

FLOOD CHARACTERISTICS OF THE RAMU RIVER, NEW GUINEA,
Papua and New Guinea Inst. of Tech., Lae (New Guinea). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15063

SOME MEASURES OF AGRICULTURAL DROUGHT,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 03F.
W73-15064

GENERALIZED HYDROLOGIC MODELING, A KEY TO DROUGHT ANALYSIS,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 02G.
W73-15065

STATISTICAL PROPERTIES OF RUNS AS APPLIED TO HYDROLOGIC DROUGHTS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02E.
W73-15075

2B. Precipitation

CLIMATOLOGICAL NOTES OF 1972 - MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
D. G. Baker.
Available from the National Technical Information Service as PB-223 909, $3.75 in paper copy, $1.45 in microfiche. In: A Report on Field Research in Soils, Soil Series 89. Department of Soil Science, University of Minnesota. p 1-25, March 1973. 7 fig, 5 tab. OWRR B-068-MINN (1). 14-31-0001-3901.

Descriptors: *Climate, *Minnesota, *Precipitation (Atmospheric), Temperature, Soil moisture.
Identifiers: *Phenological observations.

The year 1972 shall be long remembered as one of the coldest years, a summer with many flash floods and a 'month without the sun.' The year was the coldest since 1917; Minneapolis-St. Paul mean temperature in 1917 was 40.6 degrees and for 1972 - 41.3 degrees. Flash floods occurred in every month from May through September. The month of November received the least amount of sunshine of any month since sunshine records began. Yet the year can be classified as a quiet and peaceful year with respect to severe storms. There were only five tornadoes, compared with the normal of 17 per year, and all five were weak and caused little damage. Also there were less than the average number of damaging hail, wind and snow storms during the year. (Walton-Minnesota)
W73-14763

APPLICATION OF THE GRID SQUARE TECHNIQUE TO MAPPING OF EVAPOTRANSPIRATION,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02D.
W73-14824

CALCULATION OF ITEMS IN THE WATER BALANCE OF THE ATMOSPHERE AND

HYDROSPHERE (O RASCHETE ELEMENTOV VODNOGO BALANSA ATMOSFERY I GIDROSFERY),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 02A.
W73-14847

CHARACTERISTICS OF THE HYDROLOGIC CYCLE IN THE ATMOSPHERE AND POSSIBILITIES OF A LONG-TERM FORECAST OF CHANGES (ZAKONOMERNOSTI VLAGOOBOROTA V ATMOSFERE I VOZMOZHNOSTI DOLGOSROCHNOGO PREDSKAZANIYA YEGO IZMENENIY),
Main Geophysical Observatory, Leningrad (USSR).
O. A. Drozdov.
Vodnyye Resursy, No 1, p 32-41, 1972. 2 fig, 3 tab, 25 ref.

Descriptors: *Hydrologic cycle, *Atmosphere, *Forecasting, *Variability, Heat balance, Water balance, Precipitation (Atmospheric), Moisture, Temperature, Humidity, Water vapor, Climatology, Correlation analysis, Equations.
Identifiers: USSR, Hydrosphere.

A number of problems relating to the hydrologic cycle in the atmosphere and hydrosphere are discussed. Relations of heat and water balances of the earth's surface and of precipitation (amount, intensity, frequency) to atmospheric moisture, temperature, and relative humidity are analyzed. Studies are made of dispersion of water vapor in the atmosphere and of possibilities of a climatological forecast of precipitation and changes in the hydrologic cycle. (Josefson-USGS)
W73-14848

DYNAMIC MODEL OF WATER MOVEMENT IN SOIL UNDER VARIOUS CLIMATOLOGICAL CONDITIONS,
Puerto Rico Univ., Mayaguez. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 05B.
W73-14972

WEATHER MODIFICATION ACTIVITIES IN TEXAS, 1970-72.
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 03B.
W73-14998

PROBABLE MAXIMUM PRECIPITATION--THE CONCEPT, CURRENT PROCEDURES, AND OUTLOOK,
National Weather Service, Silver Spring, Md. Office of Hydrology.
J. F. Miller.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 50-61, 1973. 2 fig, 17 ref.

Descriptors: *Probable maximum precipitation, *Flood forecasting, Meteorology, Model studies, Planning, Weather data.

The basic procedure in preparing probable maximum precipitation estimates is the adjustment of precipitation values from observed storms for maximum moisture. The analyzed precipitation values for these storms are adjusted by a ratio between the maximum moisture observed over the problem basin and the moisture observed in each storm. The moisture content in both the maximum observed and the storm case is usually estimated from surface dew points. This moisture content is commonly called precipitable water, which is defined as the total atmospheric water vapor in a vertical column of unit cross-sectional area between any two specified levels. These methods and procedures have produced answers that seem to be reasonable estimates of what nature can ultimately produce. As knowledge of the atmosphere increases and ability to model the atmospheric processes increases, we will be increasingly able to make use of a modeling procedure in the field of hydrometeorology. Any dynamic model that is to be useful in this field must reproduce not only the average afternoon thunderstorm or general rain situation but also the extreme events that have occurred. (Knapp-USGS)
W73-15034

A PROPOSAL FOR ESTIMATING TROPICAL STORM PROBABLE MAXIMUM PRECIPITATION (PMP) FOR SPARSE-DATA REGIONS,
National Weather Service, Silver Spring, Md.
F. K. Schwarz.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 62-82, 1973. 9 fig, 24 ref.

Descriptors: *Probable maximum precipitation, *Synoptic analysis, Satellites (Artificial), Weather forecasting, Tropical cyclones, Weather patterns.

Generalized hemispheric-wide estimates of probable maximum precipitation, (PMP) are superior to estimates made by means of a piecemeal, nation-by-nation, approach. With emphasis on synoptic type, some areas of expected PMP control by the tropical storm type are outlined. PMP potential was determined along selected coasts to demonstrate a specific application of a hydrometeorological procedure. Careful and full use of satellite data plays a key role in the solution of the variations in tropical storm PMP. Both empirical and theoretical evidence now exist relating hurricane intensity to the magnitude of the upper-level cloud canopy. The maximum windspeed could thus be estimated from the satellite picture of the cloud system. The intensity of the upper-level airflow is a good estimate of storm intensity. (Knapp-USGS)
W73-15035

HYPOTHESES ON THE SEASONAL DISTRIBUTION OF THUNDERSTORM RAINFALL IN SOUTHEASTERN ARIZONA,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
L. J. Lane, and H. B. Osborn.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 83-94, 1973. 2 fig, 2 tab, 19 ref.

Descriptors: *Rainfall, *Variability, *Runoff forecasting, *Streamflow forecasting, Rainfall disposition, Probability, Rain gages, Statistics, Statistical methods, *Arizona.
Identifiers: Bernoulli equations.

In much of southern Arizona, thunderstorm rainfall is the most important source of water. Thus, estimates of thunderstorm rainfall are important in decisions concerning water supplies and water resource system design. Extreme flood events on small (100 square miles and less) semiarid watersheds in southern Arizona are due to air-mass thunderstorm rainfall. A single gage is not sufficient to measure thunderstorm rainfall on the 58-square-mile Walnut Gulch watershed. The occurrence of significant storms during the summer rainy season may be modeled as a Bernoulli random variable. Equations are presented for the mean and variance of the number of rainy days for two hypotheses concerning the variability of the Bernoulli parameters during the season. The first hypothesis is that the parameters are constant throughout the variable season. In this case, the distribution of rain is compound, and the distributions of the number of events in fixed subintervals is binomial. Under the second hypothesis, there is strong seasonality with considerable variations of the parameters. Short records are inadequate to decide in favor of either hypothesis. The normal distribution is an excellent approximation to the distribution of the number of events per season. (Knapp-USGS)
W73-15036

UNPREDICTABILITY OF HYDROLOGIC DROUGHTS,
Colorado State Univ., Fort Collins
P. Torranin.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 595-604, 1973. 3 fig, 6 ref. NSF Grant GK-11564.

Descriptors: *Droughts, *Weather forecasting, Correlation analysis, Water temperature, Precipitation (Atmospheric), Hydrologic cycle, Pacific Ocean, *Forecasting.

The feasibility of long-range prediction of continental droughts was investigated by using multiple-lag cross-correlation analysis. The analysis was based on 21 years of monthly precipitation data of three large areas of the west coast of the United States and of monthly sea surface temperature of 29 areas of the adjacent Pacific Ocean. Although there is a statistically significant lag cross-correlation between the monthly coastal precipitation in summer and the sea surface temperature, the correlation is not sufficiently high to use sea temperature to predict the coastal monthly precipitation. For the same significance level and the same number of independent variables used, sampling distribution of the stepwise multiple correlation coefficient obtained by an experimental data generating technique shows a higher significance value of the multiple correlation coefficient than those obtained when the independent variables are randomly selected. (Knapp-USGS)
W73-15072

TEMPORAL AND SPATIAL VARIATION OF PARAMETERS FOR THE DISTRIBUTION OF N-DAY PRECIPITATION,
Agricultural Research Service, Fort Collins, Colo.
D. A. Woolhiser, E. Rovey, and P. Todorovic.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 605-614, 1973. 3 fig, 2 tab, 8 ref.

Descriptors: *Rainfall, *Weather forecasting, *Stochastic processes, *Time series analysis, Statistical models, Distribution patterns, Probability, *Colorado, Droughts.

A stochastic model of n-day rainfall is structured such that the number of rainy days in an n-day period is described by a Markov Chain and the amount of rainfall per day is exponentially distributed. Parameters for this model were estimated for 7- and 21-day intervals at 11 eastern Colorado stations. The time variations of the parameters were fitted using a finite Fourier series and the spatial variation was accounted for by maps of the annual mean value. Such mean value maps along with a set of normalized Fourier coefficients provide a regionalized model of n-day precipitation. This model has several important advantages over the currently used gamma distribution and provides equally good fits to observed distributions. (Knapp-USGS)
W73-15073

STOCHASTIC STRUCTURES IN SPACE AND TIME OF DAILY PRECIPITATION AND THEIR SIMULATION,
Kyoto Univ. (Japan). Dept. of Civil Engineering.

or primary bibliographic entry see Field 02E.
/73-15074

ROUGHTS AS EXTREME DISTRIBUTIONS ROM A POINT RAINFALL PROCESS,
rizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
. K. Gupta, C. C. Kisiel, and L. Duckstein.
n: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 1-13, 1972, Fort Collins, Colorado: Water esources Publications, Fort Collins, p 637-647, 973. 3 fig, 1 tab, 10 ref. OWRR A-032-ARIZ (3).

escriptors: *Droughts, *Statistical models, Stochastic processes, Time series analysis, Hydrologic data, Weather forecasting, Climatology.

ritical drought durations may be modeled at a patial point in a given time interval from considerations on extreme values of a random number f droughts. Specifically, two aspects of droughts ere examined: (a) the maximum drought duration xpected within a given time interval (for example, crop season), and (b) the length of time we must ait to experience a drought that exceeds a preassigned critical duration. This approach requires little data for validation, may be transferred from ne point to another, and may be extended to duation of areal drought within a given time interval. See also W73-05777) (Knapp-USGS)
W73-15076

OME OBSERVATIONS ON SOILS-MICROCLIMATE INTERACTIONS,
Utah State Univ., Logan. Dept. of Soil Science nd Biometeorology.
For primary bibliographic entry see Field 02G.
W73-15292

2C. Snow, Ice, and Frost

A STUDY OF THE FREEZING CYCLE IN AN ALASKAN STREAM,
Alaska Univ., College. Geophysical Inst.
C. S. Benson.
Available from the National Technical Information Service as PB-223 905, $3.00 in paper copy, $1.45 in microfiche. Alaska Institute of Water Resources, College, Report IWR-36, March 1973. 31 p, 2 fig, 2 tab, 14 ref, append. OWRR A-012-ALAS (1).

Descriptors: *Ice cover, Streams, *Winter, *Alaska, *Freezing, Crystal growth, Water temperature, Ice, Supercooling, Spring, Thawing, Melt water, Streamflow, Floods.
Identifiers: *Stream freezing cycle.

The summer history of arctic and subarctic streams has received considerable attention. This is especially true for glacier streams. But these streams also have an interesting winter history which has been largely ignored. Goldstream Creek, at the Alaskan research site, is about 8 m wide and, prior to freezeup in October, it varies from 20 to 40 cm deep across the main test section. During the last 3 weeks prior to formation of a complete surface ice cover, the water temperature varies within a range of about 0.2C. Early in the nightly cooling cycle it drops to -0.01 to -0.05C for periods of several minutes up to several hours. Discs of frazil ice, 1 to 6 mm in diameter and 0.025 to 0.1 mm thick, form in the supercooled water and gradually raise its temperature to near 0C. At this stage, dendritic forms begin to grow on the discs. These adhere to the stream bottom and crystals continue to grow as turbulent flow of slightly supercooled water transports the heat of fusion to the stream's surface, where it is lost as long-wave radiation or by advection or evaporation. This process produces underwater ice. During breakup, in May, the streambed was always full of ice and the overflowing floodwaters peeled off the ice layers. (Woodard-USGS)
W73-14754

EFFECTS OF THERMAL DISCHARGES UPON THE CHENA RIVER,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-14864

THE SIGNIFICANCE OF SELECTED PHYSICAL AND CHEMICAL VARIABLES IN BENTHIC MACROINVERTEBRATE DISTRIBUTION IN A SMALL SUBARCTIC STREAM,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-14865

THE DRIFT OF BENTHIC INVERTEBRATES IN GOLDSTREAM CREEK, ALASKA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-14866

AN INVESTIGATION OF SELECTED PHYSICAL AND CHEMICAL CHARACTERISTICS OF TWO SUBARCTIC STREAMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W73-14867

MERCURY IN THE GREENLAND ICE SHEET: FURTHER DATA,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-14925

STATISTICAL COMPARISON OF AIRBORNE LASER AND STEREOPHOTOGRAMMETRIC SEA ICE PROFILES,
Naval Oceanographic Office, Washington, D.C. Polar Oceanography Div.
S. G. Tooma, Jr., and W. B. Tucker.
Remote Sensing of Environment, Vol 2, No 4, p 261-272, 1973. 11 fig, 2 tab, 9 ref.

Descriptors: *Sea ice, *Topography, *Remote sensing, *Photogrammetry, Statistics, Statistical methods, Correlation analysis, Profiles, Data collections, Surveys, Mapping.
Identifiers: *Lasers, *Lincoln Sea.

During August 1971 airborne laser profiling data and stereophotographs of sea ice were collected over the Lincoln Sea north of Greenland. A statistical comparison was made of the laser and stereophotogrammetric sea ice profiles collected on that mission. Laser and stereo profiles showed agreement in the elevations of identifiable features to approximately 23 cm. Fourier amplitude spectra derived from the profiles showed best agreement for surface wavelengths between 7.6 and 45.7 m, but was limited in part by the laser response time. Cross-correlations between profile records subjected to comb filters verified the indications of the amplitude spectra comparisons and showed cross-correlation coefficients as high as 0.83 for data of surface wavelengths of 6.1 to 91.4 m. (Knapp-USGS)
W73-14999

A PATTERN OF MUSKEG--A KEY TO CONTINENTAL WATER,
New Brunswick Univ., Fredericton. Muskeg Research Inst.
N. W. Radforth, and D. J. Bellamy.
Canadian Journal of Earth Sciences, Vol 10, No 9, p 1420-1430, September 1973. 24 fig, 1 tab, 19 ref, append.

Descriptors: (*Permafrost, *Muskeg), *Hydrogeology, Swamps, Tundra, Wetlands, Bogs, Marshes, *Peat, *Canada, Surface-groundwater relationships.
Identifiers: Hydroform.

The relationships between the airform pattern, hydrology, and history of the muskegs of Canada were studied. A new interpretive classification based on the concept of hydroform is proposed and some practical examples of its application are given. All peat is initiated within some landscape feature that possesses a certain water-holding capacity (surface retention). The developing peat modifies the surface retention producing a recognizable landscape feature. The term hydroform is proposed to contain the concept of the interaction. The presence of tall trees shows that a state of development has been reached in which drying of the surface peat occurs, thus indicating that the peat reservoir effect is reaching a maximum for that site and that template condition. Within the zone of continuous permafrost each cover type is related to certain potential maximum depth to permafrost. Within smaller areas, this relationship allows accurate assessment of the permafrost conditions within the hydroform. (Knapp-USGS)
W73-15005

2D. Evaporation and Transpiration

QUANTITATIVE HYDROLOGIC STUDY OF A CLOSED BASIN WITH A PLAYA (ESTANCIA VALLEY, NEW MEXICO),
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02A.
W73-14767

APPLICATION OF THE GRID SQUARE TECHNIQUE TO MAPPING OF EVAPOTRANSPIRATION,
Exeter Univ. (England). Dept. of Geography.
A. M. Foyster.
Journal of Hydrology, Vol 19, No 3, p 205-226, July 2973. 14 fig, 30 ref.

Descriptors: *Mapping, *Evapotranspiration, Runoff, Precipitation (Atmospheric), *Computer programs, Water balance, *Data processing, Hydrologic data, *Climatic data, Networks, Meteorological data.

A method of producing potential evapotranspiration maps for a part of southwest England uses grid-based extrapolation. Penman's equation was chosen to estimate potential evapotranspiration because it uses readily available climatic data and it produces estimates that closely resemble evaporation pan or lysimeter readings. A computer-oriented technique in association with grid data provides the best solution. A grid approach not only simplifies the production of maps but also facilitates data storage, retrieval, and processing because each square is defined by a pair of Cartesian coordinates. The easy referencing quality of a grid also allows the processing of data from subgroups of squares. Data from topographic maps is used to assemble a physiographic data file for each grid square. This file is then used as a set of independent variables in multiple regression analysis in order to extrapolate the climatological data over a grid. In this way, a file of climatological data is set up for every grid square. Values of 2 theoretical meteorological parameters are derived for each square by substituting values of physiographic parameters and daily declination of the sun and the earth-sun radius vector, into Okanoue's equation. This formula gives values of maximum possible incident radiation and maximum possible sunshine hours. Penman's monthly potential evapotranspiration estimates are then calculated by applying Penman's formula to the climatic and meteorological information for each individual grid square. (Knapp-USGS)

W73-14824

MODELING AND SIMULATION OF RESERVOIRS TO PREDICT EVAPORATION REDUCTION BY SURFACE FILMS,
Arizona State Univ., Tempe. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 03B.
W73-14868

IRRIGATION CANAL SYSTEM CAPACITY DESIGN CRITERIA,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 03F.
W73-14906

SOIL WATER CONTENT BENEATH SUMMER--DORMANT AND SUMMER-ACTIVE SWARDS IN A SEASONALLY SEMI-ARID ENVIRONMENT,
Reading Univ. (England). Dept. of Agricultural Botany.

Agric Meteorol. Vol 10, No 4/5, p 349-363. 1972. Illus.
Identifiers: Arid lands, *Australia, Clover, Cocksfoot, *Evapotranspiration, Lucerne, Phalaris, Seasonal, *Soil water, Summer, *Swards, Transpiration.

Soil water content was measured, over a period of 2 1/2 yr at Canberra, Austrailia, beneath summer-active swards (close-spaced and wide-spaced lucerne), and beneath summer-dormant swards (Phalaris and cocksfoot with subterranean clover). The measurements were made fortnightly, using the neutron scatter technique, at 0.25 m intervals down to 1.5 m. Seaonal patterns of change in soil water content were similar beneath all swards, but the changes beneath close-spaced lucerne were less than those beneath wide-spaced lucerne or grass swards at 0.5-1.25 m depth. Seventy-five percent of the changes in soil water content beneath all swards occurred in the top 0.75 m of soil. At depths greater than 1.0 m, soil water contents remained constant, and soil water potentials were less than -15 bar beneath close-spaced lucerne; small changes (2% by volume) were recorded beneath other swards. Evapotranspiration (ET) from summer-active and summer-dormant swards was similar even during summer. Less than 15% of summer evapotranspiration was supplied from the soil water store, but 30% of evapotranspiration was supplied from the soil store during spring. Seventy-five percent of the variation in ET was accounted for by variation in rainfall; only a further 4 and 3%, respectively, were accounted for by variations in open pan evaporation and available soil water. The rate of water withdrawal was linearly related to soil water content at each soil depth, but at a given soil water potential, withdrawal was 4 times greater from the top 0.5 m of the soil than from soil deeper than 1.0 m.--Copyright 1973, Biological Abstracts, Inc.
W73-15169

PLANT MOISTURE STATUS EFFECTS IN ESTIMATION OF EVAPORATION BY A COMBINATION METHOD,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
W. Shepherd.
Agricultural Meteorology, Vol 11, No 2, p 213-222, January 1973. 3 fig, 15 ref.

Descriptors: *Evaporation, *Moisture stress, *Plant tissues, *Potatoes, Measurement, Plant physiology, Moisture content, Water vapor, Leaves, Analytical techniques, Soil moisture, Water supply, Conduction, Agroclimatology.
Identifiers: Internal Conductance Formula.

Earlier attempts have been made to generalize combination-type evaporation formulae for use under conditions of restricted water supply. McIlroy (1968) formula employs a crop 'Internal conductance' factor which cannot be determined directly, but an investigation to relate this conductance to various indices of plant moisture status is described. First, relationships of this factor to the relative water content, tissue water potential and water vapor diffusion resistance of leaves were investigated for four potato crops. The regression relationships with least scatter, namely those with the relative water content of upper leaves, were employed to estimate internal conductances of three further potato crops under a range of atmospheric and soil moisture conditions. The estimates of evaporation bases on these values of conductance were significantly closer to measured values than estimates based on simple empirical relationships involving, for example, the ratio of actual to potential evaporation. (Bahre-Ariz.)
W73-15223

INTERACTIONS OF POTASSIUM CHLORIDE AND TWO ANTITRANSPIRANTS ON STOMATAL REGULATION IN ISOLATED LEAF EPIDERMAL STRIPS OF TEPHROSIA PURPUREA PERS,
Jodhpur Univ. (India). Dept. of Botany.
T. Mathur, and D. N. Sen.
Biochem Physiol Pflanz (BPP). Vol 163, No 3, p 316-319, 1972, Illus.

Descriptors: Chlorides, Epidermal, Interactions, *Leaf epidermal, Light, Membranes, Permeability, Potassium, Regulation, *Stomatal regulation, Strips, Tephrosia-Purpurea, Transpirants, *Antitranspirants.

Initially closed stomata in isolated leaf epidermal strips of T. purpurea opened when floated on distilled water in light but not in dark. Water-induced open stomata were closed down both by phenylmercuric acetate (PMA) and 8-hydroxyquinoline (8-HQ). Potassium chloride (KC1) induced the opening of stomatal aperature to a maximum in light but not in dark. KC1-Induced open stomata were completely closed down in PMA but partially in 8-HQ. The entry of K+ was limited in presence of PMA in guard cells, possibly the latter decreased the permeability of the membrane to solutes (KC1) more than 8-HQ.--Copyright 1973, Biological Abstracts, Inc.
W73-15284

2E. Streamflow and Runoff

HYDROLOGY OF SEASONALLY INUNDATED AFRICAN HEADWATER SWAMPS,
National Council for Scientific Research, Lusaka (Zambia). Water Resources Unit.
For primary bibliographic entry see Field 02A.
W73-14825

MIXING PROCESSES IN WIDE OPEN CHENNELS,
State Inst. of Hydrology and Meteorology, Warsaw (Poland).
For primary bibliographic entry see Field 05B.
W73-14828

FLOOD CONTROL IN RESERVOIRS AND STORAGE POUNDS,
Sheffield Univ. (England).
For primary bibliographic entry see Field 04A.
W73-14832

THEORIES AND RELATIONSHIPS OF RIVER CHANNEL PATTERNS,
Central Water and Power Research Station, Poona (India).
S. V. Chitale.
Journal of Hydrology, Vol 19, No 4, p 285-308, August 1973. 6 fig, 2 tab, 28 ref.

Descriptors: *Meanders, *Channel morphology, *Alluvial channels, Rivers, Geomorphology, Braiding, Sediment transport, Bed load, Suspended load.
Identifiers: *River channel patterns.

The prevalent theories and relationships about river channel patterns are reviewed with a view to determining those which are generally acceptable for the benefit of the field engineers and to bring out doubtful points which need further investigation. Classification of rivers, theories about braided and meandering channels, and correlations concerning channel patterns are discussed. (Knapp-USGS)
W73-14833

PREDICTION OF NEAR-SURFACE DRIFT CURRENTS FROM WIND VELOCITY,
Hydronautics, Inc., Laurel, Md.
J. Wu.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 9995, p 1291-1302, September 1973. 4 fig, 18 ref, append. ONR Contract N00014-73-C-0091.

Descriptors: *Currents (Water), *Winds, *Drifting (Aquatic), Waves (Water), Equations, Froude number, Fetch.

A practical procedure is outlined for determining wind-induced drift currents near the free surface, at all fetches, from a single wind-velocity measurement. The wind stress is scaled according to the Froude number and the momentum flux of the wind is considered to be partitioned between the wave drag and the momentum flux of the current. Some coefficients involved in the procedure are derived from the available data; further studies are suggested to refine the present estimation. (Knapp-USGS)
W73-14834

SUBCRITICAL KINEMATIC FLOW IN A STABLE STREAM,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
W. J. Gburek, and D. E. Overton.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 10026, p 1433-1447, September 1973. 2 fig, 2 tab, 12 ref, append.

Descriptors: *Subcritical flow, *Unsteady flow, *Non-uniform flow, *Waves (Water), *Flood waves, Flood forecasting, Flood control, Stage-discharge relations, Flow characteristics.
Identifiers: Kinematic flow.

An evaluation of the shallow water equations in the lower 6.9 miles of a stable, gently sloped tributary to the Susquehanna River showed subcritical kinematic flow. Although loops were suspected, single-valued rating functions within small statistical error were established at four points along the stream. Also, single Manning n-values with very small statistical error were established at each point. It was shown explicitly that use of a single-valued rating function does not permit simultaneous use of a single resistance coefficient. Use of a single resistance coefficient independent of stage will induce a loop rating function. This apparent inconsistency was resolved by reformulating the characteristic equations in terms of the exponent of a single-valued rating function. Therefore, for the special case of subcritical kinematic flows, streamflow synthesis may be accomplished without resort to extrapolation of uniform flow formulas to unsteady nonuniform flow. (Knapp-USGS)
W73-14839

ANE JET ON SLOPING FLOORS UNDER NITE SUBMERGENCE,
partment of the Environment, (Alberta). Water sources Div.
r primary bibliographic entry see Field 08B.
73-14840

RBULENT ENTRAINMENT IN BUOYANT TS AND PLUMES,
lifornia Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
r primary bibliographic entry see Field 05B.
73-14841

SIC PATTERNS IN MOVEMENT OF FLUVI- SEDIMENTS (OSNOVNYYE ZAKONOMERSTI DVIZHENIYA RECHNYKH NANOSOV),
ademiya Nauk SSSR, Moscow. Institut Vodkh Problem.
r primary bibliographic entry see Field 02J.
73-14850

LOOD-VOLUME DESIGN DATA FOR MISURI STREAMS,
eological Survey, Rolla, Mo.
Skelton.
issouri Geological Survey and Water Resources, ater Resources Report 28, 1973. 28 p, 2 fig, 1 ate, 4 tab, 10 ref, append.

escriptors: *Flood data, *Flood frequency, Flood flow, *Streamflow, *Missouri, Flood currence interval, Water yield, Statistical ethods, Regression analysis, Equations, Flood rofiles, Gaging stations, Hydrologic data, Flood recasting.
lentifiers: Data for ungaged sites.

lood-volume-duration data for selected recurence intervals are tabulated for 111 continuous-ecord gaging stations in Missouri. By regression nalysis, regional flood-volume equations applicale to ungaged sites with drainage basins as small s 0.2 square mile were defined for the Plains and lateaus regions. Four basin characteristics lrainage area, mean basin elevation, mean ruoff, and soils infiltration index) were statistically ignificant in defining flood volumes; one or more f these variables is required in computing the quations. (Woodard-USGS)
V73-14990

METHOD FOR ESTIMATING THE DIVERSION POTENTIAL OF STREAMS IN EASTERN MASSACHUSETTS AND SOUTHERN RHODE SLAND,
Geological Survey, Boston, Mass.
G. D. Tasker.
Journal available from Sup Doc, GPO, Washington, D.C. 20402 Price $2.75. Journal of Research of the U.S. Geological Survey, Vol 1, No 5, p 615-619, September-October 1973. 7 fig, 1 tab, 5 ref.

Descriptors: *Water yield, *Streamflow, forecasting, Planning, Water management (Applied), Stream gages, Water supply development, Water resources development, Discharge (Water), Water measurement, *Rhode Island, *Massachusetts.
Identifiers: *Diversion (Streams).

A simple method is proposed for estimating the probable magnitude and frequency of streamflow that is in excess of predetermined minimum streamflows required downstream in eastern Massachusetts and southern Rhode Island. Regional curves relate these annual volumes of streamflow excess to the average annual discharge and the median 7-day annual minimum flow of the site. Use of the curves is illustrated by a hypothetical example. (Knapp-USGS)
W73-14994

CHANGES IN FLOODFLOW CHARACTERISTICS OF A RECTIFIED CHANNEL CAUSED BY VEGETATION, JACKSON, MISSISSIPPI,
Geological Survey, Jackson, Miss.
K. V. Wilson.
Journal available from Sup Doc, GPO, Washington, D.C. 20402 Price $2.75. Journal of Research of the U.S. Geological Survey, Vol 1, No 5, p 621-625, September-October 1973. 5 fig, 1 tab, 2 ref.

Descriptors: *Mannings equation, *Roughness (Hydraulic), *Floods, *Vegetation effects, Discharge coefficient, Channel improvement, Channel flow, Channel morphology, Streamflow, Stage-discharge relations, *Mississippi.
Identifiers: Channel capacity.

Extreme changes in velocity, stage, and Manning's roughness coefficient were observed during the first year after canalization of Hanging Moss Creek at Jackson, Miss. Additional changes were observed during the following 8 years. The channel, constructed during the summer of 1963, had a 50-foot-wide bottom, 2:1 side slopes, and 12-foot depth. In March 1964, average velocities of 7.8 feet per second were measured at a 5 1/2-foot depth in the clean channel, and Manning's coefficient was computed to be 0.022. In October 1964 the average velocity was 3.2 fps at a 5 1/2-foot depth and Manning's coefficient was 0.045. The channel was then lined with fairly thick vegetation consisting of small willows, weeds, and grass. In October 1970 (summer foliage existing) the average velocity was 2.0 fps at a 5 1/2-foot depth and Manning's coefficient was 0.07. Willow trees, 8 to 10 feet high then lined the channel. In March 1971 (barren foliage), Manning's coefficent was 0.05. In March 1972 (barren foliage) Manning's coefficient was increased to 0.07. These observations indicate that the commonly used values of Manning's coefficient for channel rectification (0.02-0.03) are low and that the carrying capacity of earthen channels may be reduced 50% as a result of only 1 year's growth of vegetation and 70% as a result of 8 year's growth, the carrying capacity during summer foliage is approximately two-thirds the carrying capacity during barren winter foliage. (Knapp-USGS)
W73-14995

THE USE OF NEAR-INFRARED PHOTOGRAPHY IN THE ANALYSIS OF SURFACE MORPHOLOGY OF AN ARGENTINE ALLUVIAL FLOODPLAIN,
Texas Univ., Austin. Dept. of Geography.
D. Conway, and R. K. Holz.
Remote Sensing of Environment, Vol 2, No 4, p 235-242, 1973. 5 fig, 2 tab, 10 ref.

Descriptors: *Remote sensing, *Aerial photography, *Infrared radiation, *Mapping, *Flood plains, Alluvium, South America, Alluvial channels, Vegetation, Geomorphology, Terraces (Geologic), Data collections.
Identifiers: *Argentina.

The surface morphology of an alluvial floodplain was examined using near-infrared photographic imagery. Using plant vigor and biomass as principal signatures, features such as abandoned meanders, channel course change, and floodplain terraces could be clearly distinguished. Further, a chronological ordering of the stages of abandonment could be achieved through the recognition of distinctive vegetative patterns. The use of near-infrared imagery provides additional information to field studies of alluvial floodplains. Viewing the site from a distance gives an added perspective to the whole and the pattern of change, both spatial and temporal, can be interpreted through the medium of vegetation. The photograph also provides an important tool on which field based mapping can be recorded. (Knapp-USGS)
W73-15003

PATTERNS OF VARIABILITY OF RIVER RUNOFF AS A BASIS FOR A THEORY OF ITS REGULATION AND USE (ZAKONOMERNOSTI KOLEBANIY RECHNOGO STOKA KAK OSNOVA TEORII YEGO REGULIROVANIYA I ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 04A.
W73-15010

THOUGHTS ON THE DESIGN OF DESIGN FLOODS,
M. A. Benson.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 27-33, 1973. 11 ref.

Descriptors: *Flood forecasting, *Statistical methods, *Flood frequency, Statistics, Flood data, Floods, Maximum probable flood, Design, Planning.

Improvement in flood-frequency delineation can come about only through multistation analysis. Two alternative approaches along this line should pay large dividends to the researcher. The first is by relating flood magnitudes to characteristics of the hydrologic environment. The second is by statistical analysis of multistation data in a manner that takes advantage of the complete range of information in both time and space. Improvement of methods for determination of the rare flood is needed for design of major or critical structures. Present methods or concepts are not acceptable to the critical analyst. The uncritical acceptance of the present methods and their widespread use have fostered the illusion that satisfactory methods are available and have been a deterrent to the study needed to provide truly meaningful and sound procedures. (Knapp-USGS)
W73-15031

RELATIONSHIP OF OBSERVED RAINFALL AND RUNOFF RECURRENCE INTERVALS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02A.
W73-15032

APPLICATION OF THE METHOD OF GRADEX,
Electricite de France, Grenoble. General Technical Div.
P. Guillot.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 44-49, 1973. 1 fig, 1 tab, 1 ref.

Descriptors: *Peak discharge, *Flood forecasting, *Probability, Runoff forecasting, Hydrograph analysis, Design flood, Design flow, Hydrographs.
Identifiers: *Gradex method.

The distribution of extreme flood volume can be extrapolated using the distribution of extreme rainfall volume. The slope of the extreme rainfall distribution is called the Gradex. The unit of time selected for both volumes is approximately equal to the time base of the flood hydrograph from the watershed. The distribution of the extreme peak discharge is obtained by multiplying the flood volume by the observed average ratio of peak to volume. Thus the uncertainty about the time base of the hydrograph has a slight influence on the computed extreme discharge. A fixed interval of time is recommended to sample rainfall and flood volume rather than a variable interval selected to intercept the maximum volume. In the case of large seasonal variations of Gradex it is better to compute the probability of the peak for each

season. The product of the seasonal probabilities is the probability of the annual peak. (Knapp-USGS)
W73-15033

PROBABLE MAXIMUM PRECIPITATION--THE CONCEPT, CURRENT PROCEDURES, AND OUTLOOK,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 02B.
W73-15034

A PROPOSAL FOR ESTIMATING TROPICAL STORM PROBABLE MAXIMUM PRECIPITATION (PMP) FOR SPARSE-DATA REGIONS,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 02B.
W73-15035

HYPOTHESES ON THE SEASONAL DISTRIBUTION OF THUNDERSTORM RAINFALL IN SOUTHEASTERN ARIZONA,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W73-15036

THE ROLE OF LAG IN A QUASI-LINEAR ANALYSIS OF THE SURFACE RUNOFF SYSTEM,
Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 02A.
W73-15037

ANALYSIS OF UNITGRAPH METHOD OF FLOOD SYNTHESIS BY SHALLOW WATER EQUATIONS,
Geneva Coll., Beaver Falls, Pa. Dept. of Engineering.
For primary bibliographic entry see Field 02A.
W73-15038

DEMONSTRATION OF NONLINEAR EFFECTS OF A SECOND ORDER SURFACE RUNOFF MODEL BY FIELD DATA,
Armament Development Authority, Haifa (Israel).
For primary bibliographic entry see Field 02A.
W73-15039

REMOVAL OF UNIT HYDROGRAPH OSCILLATIONS BY FILTERING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. L. Kavvas, and E. F. Schulz.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 167-174, 1973. 3 fig, 3 ref. OWRR B-054-COLO (5).

Descriptors: *Unit hydrographs, *Hydrograph analysis, Computer programs, Flood forecasting, Peak discharge, Fourier analysis.

Unit hydrographs derived from recorded floods sometimes exhibit oscillations. These oscillations can be removed by filtering. The success of this procedure is explained by the fact that the watershed system behaves as a low-pass filter. Stable, nonoscillating unit hydrographs were calculated for several events. The procedure is quite practical since it needs a minimum amount of calculations and plotting of curves. The computer program for the line spectrum takes about 5 seconds of computer time for each event and uses less than 43,000 core spaces for computer storage. The main factor of the unit hydrograph oscillations is the sampling interval. Taking too small sampling intervals increases the data points taken from the original data function. However, it also brings the higher frequencies and their unwanted contributions. Taking too large intervals has the opposite effect, but the larger interval has the effect of decreasing the resolution of the rising limb, crest segment and the early part of the recession limb of the unit hydrograph. Therefore, it is necessary to find an optimum sampling interval which will give the most data points without violating the functions of a low pass filter. (Knapp-USGS)
W73-15040

FLOOD EVALUATION BY SOME DATA GENERATION TECHNIQUES,
Birmingham Univ., (England). Dept. of Civil Engineering.
N. T. Kottegoda.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 189-199, 1973. 6 fig, 2 tab, 9 ref.

Descriptors: *Flood forecasting, *Synthetic hydrology, Variability, Mathematical models, Peak discharge, Flood frequency, Statistics, Statistical models, Stochastic processes.

Data generation is proposed for the estimation of rare floods. All the information in daily mean flow data are used with close fitting probability functions and seasonal variations in parameters and distributions. The Johnson and Pearson families of distributions were investigated. A time limit of 5 days was adopted. Through interpolation, the use of hydrograph properties and pertinent statistics in historical data, a daily series is formed. For modeling the persistence in the data, a fourth order autoregressive model and a functional noise model were used. (Knapp-USGS)
W73-15041

LONG TERM RUNOFF ANALYSIS BY A CONCEPTUAL PHYSICAL MODEL,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 02A.
W73-15042

PREDICTION OF RESERVOIR FILLING FOR STREAMS SUBJECT TO ERRATIC FLOODS,
Centrais Electricas de Sao Paulo (Brazil). Div. of Hydrology.
For primary bibliographic entry see Field 04A.
W73-15043

PRACTICAL DECISION RULES IN RESERVOIR OPERATION,
Universidad Nacional Autonoma de Mexico, Mexico City.
For primary bibliographic entry see Field 04A.
W73-15044

PRIORITY RANKING OF FUTURE FLOOD CONTROL INVESTMENTS,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 06D.
W73-15045

INTEGRATED HYDROLOGIC AND SOCIETAL INTERACTIONS TO FLOODS AND DROUGHTS IN INDIA,
Madhya Pradesh Government Control Board for Major Projects, Bhopal (India).
D. R. Sikka.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 237-245, 1973. 2 tab.

Descriptors: *Floods, *Droughts, *Planning, Flood control, Flood protection, Warning systems, Water resources development, Data collections, Hydrologic.
Identifiers: *India.

Floods and droughts cannot be treated in isolation; they have to be parts of integrated development of water resources. Flood data and forecasts could save direct damages, but they could not provide the long term relief for which a comprehensive flood plain is essential. India is traversed by a large number of river systems and experiences seasonal floods. Sustained floods occur mainly during the southwest monsoon season in the months of July, August, and September. However, floods do occur during the month of October, and even though the frequency of floods in some parts of northeast and central India is much less than during monsoon months, their results are devastating due to high antecedent soil moisture conditions. (Knapp-USGS)
W73-15046

FLOOD CONTROL POLICIES DEVELOPED BY SIMULATION,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 04A.
W73-15047

FLOOD CONTROL PLANNING WITH INADEQUATE HYDROLOGIC DATA,
Malyiya Regional Engineering Coll., Jaipur (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-15048

LOG-PEARSON TYPE III AND GUMBEL ANALYSES OF FLOODS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
B. M. Reich.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 291-303, 1973. 8 fig, 2 tab, 8 ref.

Descriptors: *Flood frequency, *Flood forecasting, *Flood data, Variability, Probability, Statistical methods, Statistics, *Pennsylvania.
Identifiers: Log-Pearson analysis, Gumbel analysis.

Annual flood series of 15 years or more from 83 Pennsylvania watersheds under 214 sq mi were analyzed by Log-Pearson and Gumbel curve fitting methods. The general character of flood frequency plots is described with examples. Gumbel estimates are far more stable, even from less than 20 years data. The response of practicing engineers to a questionnaire concerning the goodness of fitting observed flood records by these two and the Log-Gumbel method is presented. The most striking pattern from the evaluation was engineers' rejection of Log-Gumbel curves. For every watershed the Log-Gumbel was declared unacceptable by at least one judge. The Log-Gumbel frequency curve generally seems unrealistically high beyond about 25-year return period. Log-Pearson Type III curves had the best weighted sum score in 42 of the 84 series. The Gumbel straight-line distribution was declared highly satisfactory in almost as many evaluations as was the LP III. (Knapp-USGS)
W73-15049

BEST FITTING OF PROBABILITY FUNCTIONS TO A SET OF DATA FOR FLOOD STUDIES,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
G. Cicioni, G. Giuliano, and F. M. Spaziani.

In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 304-314, 1973. 2 fig, 2 tab, 11 ref.

Descriptors: *Flood frequency, *Flood forecasting, Statistical methods, Statistics, Flood data, Variability, Probability.
Identifiers: *Italy.

Probability functions were evaluated for best fit in annual flood series. The following probability functions are considered: two-parameter log-normal distribution, three-parameter log-normal distribution, two-parameter Gamma distribution, Pearson Type III distribution, and extreme value Fisher-Tippett distributions. The maximum likelihood method was used for estimating the distribution parameters from the observed data. Goodness of fit was evaluated by some parametric and nonparametric statistics. The application to a set of over 100 stations in Italy is discussed. On the basis of fitting evaluation as well as physical constraints on variables range, the two-parameter log-normal distribution seems to be the most suitable for describing the set of annual flood series. (Knapp-USGS)
W73-15050

RELIABILITY OF ESTIMATES OF THE EXCEEDENCE PROBABILITY OF A GIVEN FLOOD MAGNITUDE,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 315-324, 1973. 2 fig, 5 tab, 10 ref.

Descriptors: *Flood frequency, Decision making, *Simulation analysis, Flood data, *Probability, Variability, Stochastic processes, Flood recurrence interval, Flood forecasting, *Risks.

Two 3-parameter lognormal populations representing the range of variability in annual flood peaks normally encountered are used to demonstrate uncertainty experienced when estimating flood exceedence probabilities from samples typically containing 20 to 50 flood events. For situations requiring accurate estimates of flood events having exceedence probabilities smaller than 2%, record lengths much greater than those available are required. Uncertainty can be greatly reduced by simulating a very long sequence of floods from stochastically generated precipitation. Expenditure required to achieve reduction in uncertainty can be determined by employing decision analysis techniques. (Knapp-USGS)
W73-15051

A NEW PROPOSAL FOR COMPUTATION OF FLOOD FREQUENCY,
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
H. G. Mendel.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 325-333, 1973. 1 fig, 3 tab, 8 ref.

Descriptors: *Flood frequency, *Flood data, *Probability, Variability, Statistical methods, Flood recurrence interval, Flood forecasting.

One advantage of the commonly used flood frequency distributions is that, analytically, they are of very simple construction, allowing the immediate determination of the return period if the empirical distribution is known. However, these distributions, including Extremal I (Gumbel), Pearson III (Foster), Log Pearson III, Fuller, Fechner and Normal, involve the great disadvantage of insufficient flexibility; their adaptation to the empirical distribution derived from the available sample is frequently inadequate. Mathematical tests are required as selection criteria. The Generalized Gamma Distribution is extremely well suited for determining flood frequency from a sample. For arid or semiarid areas (combination with Fuller's law), this distribution may yield a double peak distribution with a positive probability for zero discharge. At higher discharges, Extremal Type I, Pearson III and Log Pearson III fall outside the empirical distribution. (Knapp-USGS)
W73-15052

RISKS FROM USING INADEQUATE FLOOD RECORDS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Hydraulic Engineering.
S. Pinkayan, and P. Premchun.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 334-342, 1973. 3 fig, 1 tab, 9 ref.

Descriptors: *Flood data, *Data collections, Statistical methods, Variability, Probability, *Risks, Design flood, Hydrologic data.
Identifiers: Inadequate hydrologic data.

Risks and uncertainties are always associated with the estimated magnitude of a design flood determined from a certain period of flood records. These risks depend upon the number of flood events used in the estimation. The extreme value distribution of type I was used to describe the annual floods of northern Thailand. The parameters a and b of the distribution were estimated from the record. Student's t distribution was used to estimate the population parameters of the distribution. For the same value of flood magnitudes, two different return periods were calculated from the two sets of parameters. The difference between these two return periods define the risks of the flood estimation. The general characteristics of risks are described as a function of the number of years of record and the return period. A minimum period of flood records is recommended on the basis of structure life, encounter probability, and allowable risks. (Knapp-USGS)
W73-15053

STOCHASTIC MODEL OF FLOOD RISK EVALUATION,
West Virginia Inst. of Tech., Montgomery. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-15054

A MODIFIED MONTE CARLO TECHNIQUE TO SOLVE GROUNDWATER MOVEMENT AS AFFECTED BY FLOOD STAGES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 02F.
W73-15055

ANALYSIS OF RISKS AND UNCERTAINTIES IN FLOOD CONTROL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-15056

OBJECTIVE REGIONALIZATION OF PEAK FLOW RATES,
Agricultural Research Service, Chickasha, Okla. Soil and Water Conservation Research Div.
D. G. De Coursey.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 395-405, 1973. 3 fig, 6 tab, 6 ref.

Descriptors: *Hydrologic data, *Peak discharge, *Flood forecasting, *Statistics, Estimating, Statistical methods, Flood data, Rainfall-runoff relationships, Regional analysis, *Oklahoma.
Identifiers: *Regionalization.

Hydrologic data must be estimated at many sites. Prediction equations based on regionalized data should be used to estimate such data. Regionalization is demonstrated using 4 peak flow rates and 12 watershed characteristics from 90 stations in Oklahoma. The 90 stations were divided into a base set of 60 stations and an independent test set of 30 observations. Stations in the base set were regionalized on the basis of similarity of hydrologic response using discriminant analysis and an iterative algorithm. The test set of 30 watersheds was classified into the 3 groups using discriminant functions. Peak rates were predicted using linear multiple regression equations based on the same set of watershed characteristics: drainage area, mean annual precipitation, and the 2- and 100-year precipitation intensity. The peak rates of the 30 independent stations were also predicted using conventional stepwise regression equations that had been developed from the base set of 60 observations. Comparison of the two schemes showed that prediction from regionalized data had a consistently smaller standard error of estimate and that the use of the same watershed characteristics in the prediction of all four peaks led to a much better hydrologic continuity than using the conventional stepwise regression technique to develop the prediction equation for each peak rate independently. (Knapp-USGS)
W73-15057

SOME METHODS FOR ESTIMATION OF FLOODS IN A TROPICAL AREA,
World Meteorological Organization, San Jose (Costa Rica). Central American Hydrometeorological Project.
E. Basso.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 406-417, 1973. 6 fig, 3 tab, 7 ref.

Descriptors: *Flood forecasting, *Rainfall-runoff relationships, *Rational formula, Equations, Time of concentration.
Identifiers: *Central American Isthmus, Costa Rica.

Estimation of floods in the Central American Isthmus is difficult because of lack of long and reliable discharge records. For 33 small basins, up to 250 sq km in area, the concentration time can be estimated. Previous soil conditions do not significantly change these results. Rainfall envelopes for the area are shown and compared with information from other areas. A flood envelope for the Central American Isthmus obtained by the Central American Hydrometeorological Project is presented and is compared with similar curves resulting from the application of the rational method. (Knapp-USGS)
W73-15058

WATERSHED FLOOD ROUTING USING DISTRIBUTED PARAMETERS,
Agricultural Research Service, Brookings, S. Dak.
C. A. Onstad.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 418-428, 1973. 3 fig, 2 tab, 16 ref.

Descriptors: *Flood routing, *Flow nets, *Routing, Overland flow, Infiltration, Roughness (Hydraulic), Open channel flow, Wetting.
Identifiers: Kinematic wave theory.

A method for considering distributed input parameter distribution is based on flow net theory. Contour lines on a watershed topographic map are considered to be equipotential lines. Streamlines are constructed normal to the contour lines. The result is a collection of incremental units, each assumed to be homogeneous, representing the natural sequence of the watershed drainage network. Each incremental unit starting with rainfall is computed using the Green and Ampt model for infiltration into layered soils and the kinematic flow equations for routing overland and channel flow. In this manner, hydrographs can be calculated at any desired location on the watershed itself or in the channel. The parameters required for each incremental unit in addition to its geometry are the hydraulic roughness of the surface and the thickness, the bulk density, the saturated hydraulic conductivity, the initial moisture condition, and the pressure head characteristic at the wetting front for each layer in the soil profile. Channel and reach geometry together with hydraulic roughness are the input parameters necessary for channel routing using the kinematic formulation. (Knapp-USGS)
W73-15059

MODEL FOR CALCULATING FLOODS IN URBANIZED WATERSHEDS,
Technische Hochschule, Brunswick (West Germany).
For primary bibliographic entry see Field 04C.
W73-15060

PREDICTIVE STUDY ON URBANIZING EFFECT OF DRAINAGE BASIN ON FLOOD RUNOFF,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 04C.
W73-15061

SIGNIFICANCE OF THE GENESIS OF FLOODS ON PROBABILITY ANALYSIS,
Ebasco Services, Inc., New York.
B. S. Browzin, C. A. Baumbusch, and M. G. Pavlides.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 450-461, 1973. 2 fig, 1 tab, 13 ref.

Descriptors: *Floods, *Time series analysis, *Probability, *Flood forecasting, Meteorology, *Texas, Statistics, Statistical methods, Variability, Duration curves, Flood data.
Identifiers: *Flood probability.

The rainfall floods of different meteorological origin (caused by tropical cyclones, by squall-line thunderstorms, or by collision of cool air with warm moisture-laden air) are of different character and might not form a homogeneous series susceptible to probability flood analysis. Particular types of precipitation may belong to specific seasons. Texas floods were studied in this respect. Major floods occur on Texas rivers in the spring and the fall. The spring and fall floods may have different genesis. Different conditions of the terrain which may exist in the spring and in the fall could further contribute to modify the character of floods. Consequently, if the annual flood series is used, the series may not be homogeneous. Probability analysis based on the fall, spring, and annual series revealed that the floods predicted on the basis of seasonal series are larger than those based on the annual series. Consequently, the genesis of rainfall floods should be considered as a factor in choosing the data for the flood series for probability analysis in certain regions. (Knapp-USGS)
W73-15062

FLOOD CHARACTERISTICS OF THE RAMU RIVER, NEW GUINEA,
Papua and New Guinea Inst. of Tech., Lae (New Guinea). Dept. of Civil Engineering.
E. M. Laurenson.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 462-476, 1973. 7 fig, 1 tab, 4 ref.

Descriptors: *Floods, *Rainfall-runoff relationships, *Channel morphology, Flood plains, Meanders, Tropical regions, Wet climates, Variability, Hydrograph analysis, Unit hydrographs, Flood frequency.
Identifiers: *New Guinea (Ramu River).

The climate of New Guinea, which lies close to the Equator and outside the area subject to tropical cyclones, exhibits both an unusually high degree of uniformity from year to year and unusually high variability from point to point. These characteristics are particularly evident on the Ramu River catchment, whose extremely flat flood frequency curve is contrasted with an extremely steep one for the Namoi River in New South Wales. These characteristics make the use of the unit hydrograph method and the enveloping curve method of flood estimation difficult but at the same time render the use of flood frequency studies more reliable. River channel cross sections in sinuous and meandering sections of the Ramu River are compared. The stability of the sinuous section of channel is explained by its low channel capacity. A cross section of the flood plain clearly demonstrates the existence of natural levees, and the implications of these for bridge backwater computation are discussed. (Knapp-USGS)
W73-15063

GENERALIZED HYDROLOGIC MODELING, A KEY TO DROUGHT ANALYSIS,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 02G.
W73-15065

A METHODOLOGY FOR ANALYSING AGRICULTURAL DROUGHT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03F.
W73-15066

SIMULATION MODEL FOR THE DECISION BETWEEN DILUTION OR SEWAGE TREATMENT DURING DROUGHTS,
Universidade Federal Sao Carlos, Sao Paulo (Brazil). Dept. of Hydraulics.
For primary bibliographic entry see Field 05G.
W73-15067

USE OF REGIONAL ECONOMIC MODELS IN THE EVALUATION OF DROUGHT IMPACT,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 06B.
W73-15068

THE ROLE OF WEATHER MODIFICATION IN DROUGHT RELIEF,
Bureau of Reclamation, Denver, Colo. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 03B.
W73-15069

REGIONAL WATER EXCHANGE SYSTEM AS AN ALTERNATIVE FOR ALLEVIATING DROUGHT PROBLEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06B.
W73-15070

A NOTE ON THE GENERATION OF GAMMA RANDOM VARIABLES WITH NON-INTEGRAL SHAPE PARAMETER,
Birmingham Univ. (England).
For primary bibliographic entry see Field 07C.
W73-15071

UNPREDICTABILITY OF HYDROLOGIC DROUGHTS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02B.
W73-15072

TEMPORAL AND SPATIAL VARIATION OF PARAMETERS FOR THE DISTRIBUTION OF N-DAY PRECIPITATION,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 02B.
W73-15073

STOCHASTIC STRUCTURES IN SPACE AND TIME OF DAILY PRECIPITATION AND THEIR SIMULATION,
Kyoto Univ. (Japan). Dept. of Civil Engineering.
T. Ishihara, and S. Ikebuchi.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 615-626, 1973. 5 fig, 3 tab, 2 ref.

Descriptors: *Runoff forecasting, *Stochastic processes, *Simulation analysis, Statistical models, Rainfall-runoff relationships, Data collections, Gaging stations, Hydrologic data, Droughts.
Identifiers: *Japan (Yodo River basin).

For the development and utilization of water resources, especially in droughts, it is necessary to establish techniques for long-range runoff simulation. Since precipitation has regional and seasonal fluctuations, there is a need for a long record and for many stations. Stochastic structures in space and time are estimated from their interrelations; these include regional correlation analysis between the base station and the surrounding stations, spatial simulation between stations, and sequential simulation at the base station. Daily precipitation is predicted over a long period and a wide area. Areal daily precipitation may be estimated by the Thiessen method. The results applied to the Yodo River basin in Japan adequately represent the characteristics of observed data. Furthermore, the runoff data combined with the basin system model agrees well with stream records. (Knapp-USGS)
W73-15074

STATISTICAL PROPERTIES OF RUNS AS APPLIED TO HYDROLOGIC DROUGHTS,
Colorado State Univ., Fort Collins.
J. Millan.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 627-636, 1973. 1 fig, 1 tab, 10 ref. NSF Grant GK-11564.

Descriptors: *Droughts, *Statiistics, *Probability, Markov processes, Time series analysis, Claimatology, Distribution patterns, Water shortage, *Streams.

A method is presented for computing the probability distribution of droughts based on runs. The longest negative run length and the largest negative run sum are used as basic parameters. The probability distribution of the length of the longest run of one kind is determined exactly for the case in which the series of surplus and deficits can be described by a Markov Chain. The degree to which this result approximates the case of an observed time series described by a first-order autoregressive model was determined. Experimental methods were used to verify a hypothesis extending the results to the case of a truncation level in the form of a linear trend and to determine an empirical fitting to the distribution of the largest run sum. (Knapp-USGS)
W73-15075

DROUGHTS AS EXTREME DISTRIBUTIONS FROM A POINT RAINFALL PROCESS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 02B.
W73-15076

THEORETICAL STUDIES ON GAMMA-TYPE DISTRIBUTION AND RUNS--THEIR APPLICATIONS TO HYDROLOGY,
Osaka Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-15077

STORM-GENERATED CURRENT IN LA JOLLA SUBMARINE CANYON, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
F. P. Shepard, and N. F. Marshall.
Marine Geology, Vol 15, No 1, p M19-M24, August 1973. 2 fig, 11 ref.

Descriptors: *Currents (Water), *Continental shelf, *California, *Turbidity currents, *Storm surge, Winds, Velocity, Submarine canyons.
Identifiers: *La Jolla Submarine Canyon (Calif).

Current meters were operating in La Jolla Submarine Canyon at 200 m depth during a period of high seas and onshore winds up to 62 km/h. The records show a downcanyon speed up to 50 cm/sec, considerably higher than any earlier measurements. This was followed by an abrupt termination of data, evidently due to the meters being engulfed in seaward-moving kelp masses. The record may provide evidence of the initial stages of a turbidity current. The conditions for such a current were provided by the piling up of water at the canyon head by the unusually strong onshore wind. (Knapp-USGS)
W73-15268

NO CURRENT REVERSAL AT 10,000 B.P. IN THE STRAIT OF GIBRALTAR,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
L. Diester-Haass.
Marine Geology, Vol 15, No 1, p M1-M9, August 1973. 3 fig, 1 tab, 17 ref.

Descriptors: *Currents (Water), *Bottom sediments, *Sedimentation, Ocean circulation, Stratigraphy, Deposition (Sediments), Paleohydrology, Sedimentary structures, Sediment sorting, Particle size.
Identifiers: *Mediterranean Sea.

Two cores were taken west of Gibraltar within the region of recent current influence of Mediterranean bottom outflow. A coarse-fraction analysis was made in order to see if current influence occurs in the lutitic sediments and whether there has been a change in current systems. In most parts of the cores, the curves of median diameters of planktonic and benthonic foraminifers are parallel. The sediments are sorted by the Mediterranean bottom outflow, which reduces sedimentation of small sand-sized particles. In some core sections there is no sorting. Sorting and nonsorted layers are contemporaneous in the two cores. Current reversal in Holocene and Late Pleistocene, from 10,000 to 17,000-21,000 years B.P., is most unlikely. The two nonsorted layers in the lower core sections (17,000-21,000 to 34,000-46,000 years B.P.) may have been produced by current reversals or by a northerly shift of the Mediterranean bottom outflow in the Bay of Cadiz. (Knapp-USGS)
W73-15273

2F. Groundwater

QUANTITATIVE HYDROLOGIC STUDY OF A CLOSED BASIN WITH A PLAYA (ESTANCIA VALLEY, NEW MEXICO),
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02A.
W73-14767

EXPERIMENTS IN TRACING UNDERGROUND WATERS IN LIMESTONES,
Bristol Univ. (England). Dept. of Geography.
T. C. Atkinson, D. I. Smith, J. J. Lavis, and R. J. Whitaker.
Journal of Hydrology, Vol 19, No 4, p 323-349, August 1973. 15 fig, 2 tab, 32 ref.

Descriptors: *Tracers, *Groundwater movement, *Karst hydrology, Limestones, Dye releases, Karst, Hydrogeology, Surface-groundwater relationships.
Identifiers: *England.

Two experiments were conducted in the Carboniferous Limestone aquifer of the Mendip Hills, Somerset, to compare the relative merits of differing groundwater tracers. The tracers employed were lithium acetate, polyethylene powder, Lycopodium spores, and the fluorescent dye Pyranine; all were introduced into the aquifer at stream sinks. Lithium acetate and polyethylene powder were totally unsuccessful. The rates of travel of the fluorescent dye and Lycopodium spores were very similar. Absolute concentration for dye can be determined using a field continuous flow fluorometer. The quantitative dye concentration data can be used with simultaneous measurements of discharge at the spring to deduce the flow geometry of the system; the input, tributary, distributary and maximum discharges in the system; and the volume of the underground conduits. Exchange takes place between the flooded conduit and the surrounding fissured bedrock in a manner analogous to bank storage in rivers flowing on alluvium. (Knapp-USGS)
W73-14830

SEEPAGE INTO SHEET PILE COFFERDAM,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-14843

VALIDITY OF DUPUIT-FORCHHEIMER EQUATION,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering.
W. A. Murray, and P. L. Monkmeyer.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 9997, p 1573-1583, September 1973. 4 fig, 16 ref, append.

Descriptors: *Dupuit-Forchheimer theory, *Groundwater movement, *Slopes, Equations, Drawdown, Water yield, Mathematical studies, Aquifers.

The Dupuit-Forchheimer equation describing unconfined groundwater flow is limited by the underlying assumptions inherent in its derivation. A validity criterion developed from an analysis of the exact equations of motion shows that, in general, the Dupuit-Forchheimer equation describes a rising water table more accurately than a falling one. In the steady state the criterion reduces to a simple restriction on the free surface slope. For unsteady flow, the criterion involves both the free surface slope and the rate of change of the free surface position. The free surface slope must be no greater than 1:10 if results are expected to be within 1% of exact. More accurate results should be obtained by using data from either a recharging well or the recovery period after pump shutdown rather than drawdown data. (Knapp-USGS)
W73-14844

STUDY OF GROUNDWATER RESOURCES IN THE USSR (IZUCHENIYE RESURSOV PODZEMNYKH VOD SSSR),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 04B.
W73-14849

INVESTIGATION OF THE WATER TABLE IN A TIDAL BEACH, FINAL REPORT.
Virginia Inst. of Marine Sciences, Gloucester Point.

Available from NTIS, Springfield, Va., 22151 as AD-751 081, $3.00 paper copy; $1.45 in microfiche. Special Scientific Report No. 60, October 1, 1971, 163 p. ONR-GP Contract N00014-70-C-0004.

Descriptors: *Water level fluctuations, *Water table, *Beaches, *Tides, *Waves (Water), Data collections, Sands, Instrumentation, Groundwater movement, Surface-Groundwater relationships, Beach erosion, Sediment transport, Surf, *Virginia.

Papers included in the report are: Instrumentation for Measurement of Water Table Fluctuations; The Beach Water Table as a Response Variable of the System; Changes in Foreshore Sand Volume: Role of Fluctuations in Water Table and Ocean Still Water Level; One-dimensional Finite Element Analysis of the Groundwater Flow; and Two-dimensional Finite Element Analysis of the Groundwater Flow. (See W72-05033, W72-01140 and W73-14986 thru W73-14989)
W73-14985

INSTRUMENTATION FOR MEASUREMENT OF BEACH WATER-TABLE FLUCTUATIONS,
Virginia Inst. of Marine Science, Gloucester Point.
J. D. Boon, III, and W. Harrison.
In: Investigation of the Water Table in a Tidal Beach; Virginia Institute of Marine Science Special Scientific Report No 60, p 1-14, October 1971. 8 fig, 1 ref.

Descriptors: *Water table, *Water levels, *Water level fluctuations, *Instrumentation, *Beaches, Gages, Telemetry, Data collections, Groundwater, Tides, Floods, Storm surge, Infiltration.

A system for acquisition of water-level data from the water table of a sandy ocean beach consists of a slotted PVC well pipe with nonslotted upper section, housing a float and float wire, a galvanized steel pipe, housing a counterweight and counterweight line, and a float-gage system connected to a precision potentiometer. A low-voltage power source connects to the potentiometer which gives an output corresponding to the elevation of the water table. The response of such a float-pulley system is accurate to plus or minus 3.0 mm, and it exhibits a high degree of precision. Details of fabrication and installation of the monitoring system are given. Selected portions of an analog

plot of output from 11 to 13 wells that operated continuously for 31 days are also presented. (See also W73-14985) (Knapp-USGS)
W73-14986

THE WATER TABLE AS A RESPONSE VARIABLE OF THE SYSTEM,
Virginia Inst. of Marine Science, Gloucester Point.
L. E. Fausak.
In: Investigation of the Water Table in a Tidal Beach; Virginia Institute of Marine Science Special Scientific Report No 60, p 15-42, October 1971. 13 fig, 4 tab, 14 ref.

Descriptors: *Water level fluctuations, *Water table, *Beaches, *Tides, *Waves (Water), Data collections, Sands, Instrumentation, Groundwater movement, Surface-groundwater relationships, Beach erosion, Sediment transport, Surf.

Fluctuations of the water table of a tidal marine beach over a 30-day period were examined. Variations in still-water level, swash runup distance, distance of a sampling station from the shoreline, and atmospheric pressure were determined for rising half-tide cycles in 13 water table monitoring wells spaced along a transect perpendicular to the shoreline. Tidal oscillations exerted the strongest influence in all except the two seawardmost wells and in the most landward well. Distance from the shoreline is the most important variable in the seaward wells because of decay of the input wave and the resultant large range of water-table fluctuations near the beach face. Atmospheric pressure is the dominant variable influencing water-table fluctuations in the most landward well, due to the relatively slight contribution of the tide and wave inputs. The amplitude of the water-table fluctuations decreases exponentially in a landward direction and the lag time of the input wave increases linearly with distance from the shoreline. The time lag is approximately 60 minutes per 18 meters of depth. (See also W73-14985) (Knapp-USGS)
W73-14987

CHANGES IN FORESHORE SAND VOLUME ON A TIDAL BEACH: ROLE OF FLUCTUATIONS IN WATER TABLE AND OCEAN STILL--WATER LEVEL,
Virginia Inst. of Marine Science, Gloucester Point.
W. Harrison.
In: Investigation of the Water Table in a Tidal Beach; Virginia Institute of Marine Science Special Scientific Report No 60, p 43-62, October 1971. 5 fig, 2 tab, 16 ref.

Descriptors: *Sediment transport, *Beaches, *Groundwater, *Surf, Erosion, Sedimentation, Percolation, Groundwater movement, Water levels, Water level fluctuations, Virginia.
Identifiers: Virginia Beach (Va).

A 30-day-long time series of observations of variables in the beach-ocean-groundwater system was made at Virginia Beach, Virginia, during August and September 1969. Results of linear multiregression analysis of the data show that the change in ocean still-water level is the single most important variable influencing changes in quantity of foreshore sand over intervals of half-tidal-cycle to tidal-cycle length. An index of groundwater head is the next strongest predictor of sand volume, followed closely by the number of swash events over the time interval in question. (See also W73-14985) (Knapp-USGS)
W73-14988

GROUNDWATER FLOW IN A SANDY TIDAL BEACH. 1. ONE-DIMENSIONAL FINITE-ELEMENT ANALYSIS,
Virginia Inst. of Marine Science, Gloucester Point.
W. Harrison, C. S. Fang, and S. N. Wang.
In: Investigation of the Water Table in a Tidal Beach; Virginia Institute of Marine Science Special Scientific Report No 60, p 63-109, October 1971. 7 fig, 2 tab, 13 ref.

Descriptors: *Water level fluctuations, *Water table, *Beaches, *Tides, *Waves (Water), Data collections, Sands, Instrumentation, Groundwater movement, Surface-groundwater relationships, Beach erosion, Sediment transport, Surf, Virginia.
Identifiers: *Virginia Beach (Va).

Flunctuations in the beach water table at Virginia Beach, Virginia, were studied. Special instrumentation was designed for monitoring the water-table surface. The major environmental variables responsible for the fluctuations were evaluated by multiregression analysis in which the dependent variable was the rise of the water table in a well, and the independent variables were atmospheric pressure, the rise in ocean still-water-level, the distance of the well from the foreshore, and the contribution of the uprush to the water table. One- and two-dimensional finite-element models were constructed to model the groundwater flow. Descriptions of and listings for the FORTRAN computer programs are given. Changes in foreshore sand volume, as a result of fluctuations in the water table, changes in head gradient, and oscillations in the oceanic still-water level were also studied. Predictor equations were developed for changes in quantity of foreshore sand over intervals of one-half and entire tidal cycles. (See also W73-14985) (Knapp-USGS)
W73-14989

AQUIFER DIFFUSIVITY OF THE OHIO RIVER ALLUVIAL AQUIFER BY THE FLOOD-WAVE RESPONSE METHOD,
Geological Survey, Louisville, Ky.
H. F. Grubb, and H. H. Zehner.
Journal available from Sup Doc, GOP, Washington, D.C. 20402 Price $2.75. Journal of Research of the U.S. Geological Survey, Vol 1, No 5, p 597-601, September-October 1973. 6 fig, 1 tab, 7 ref.

Descriptors: *Groundwater movement, *Flood waves, *Surface-groundwater relationships, *Aquifer testing, Alluvium, Alluvial channels, *Ohio River, Base flow, Recession curves.
Identifiers: Aquifer diffusivity.

Aquifer diffusivity was calculated for 10 sites in the alluvial aquifer adjacent to the Ohio River by observing the response of the aquifer to a flood wave in the river. Calculated type curves matched the observed aquifer response reasonably well at eight of the 10 sites. The diffusivities ranged from 0.4 sq ft per sec to 10.3 sq ft per sec and were generally in agreement with diffusivity values calculated from pump-test methods at two of the sites. Determining the shape of the groundwater recession curve may be difficult, but it can be done satisfactorily by collecting water-level data during an extended period of groundwater discharge and transposing the average recession curve to the flood period being analyzed. The flood-wave response method for estimating aquifer diffusivity provides a relatively inexpensive technique for obtaining a significant part of the data needed to predict the aquifer's response to river and pumping stresses. (Knapp-USGS)
W73-14991

A MODIFIED MONTE CARLO TECHNIQUE TO SOLVE GROUNDWATER MOVEMENT AS AFFECTED BY FLOOD STAGES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
S. F. Shih.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 349-362, 1973. 6 fig, 3 tab, 9 ref.

Descriptors. *Groundwater movement, *Floods, *Monte Carlo method, Surface-groundwater relationships, Statistical methods, Computer programs, Unsaturated flow, Saturated flow
Identifiers: Random walk method

The Monte Carlo method can be applied in obtaining the approximate solution of the problems of groundwater movement as affected by various flood stages. The advantages of applying the Monte Carlo method to problems of water movement in soils are that difficult problems such as various flood stages, irregular-shaped boundaries, and nonhomogeneous flow media, where analytical formulation is not generally available can be solved; and also, systems with solutions at only a few points in the flow media can be solved independently. The simultaneity or modified Monte Carlo procedure was developed to hasten the classical Monte Carlo application. The simultaneity procedures can be applied directly to obtain the solution of groundwater movement as affected by various flood stages without analytically solving the flow equation. The simultaneity procedure has the same accuracy as the classical Monte Carlo method but computing time is reduced by approximately 50% in the fixed random walk procedure and 30% in the arbitrary-shaped random walk procedure. Arbitrary-shaped random walk procedure can reduce by 50% the computing time in both classical and simultaneity procedures. (Knapp-USGS)
W73-15055

2G. Water in Soils

THE INFLUENCE OF SLOPE ORIENTATION UPON THE SOIL MOISTURE REGIME, AND ITS HYDROGEOMORPHOLOGICAL SIGNIFICANCE,
Birkbeck Coll., London (England).
I. Reid.
Journal of Hydrology, Vol 19, No 4, p 309-321, August 1973. 4 fig, 2 tab, 38 ref.

Descriptors: *Slopes, *Geomorphology, *Soil moisture, Water balance, Rainfall disposition, Infiltration, Erosion, Degradation (Slope), *Soil water movement, Solar radiation, Evapotranspiration.
Identifiers: Slope orientation.

Slope insolation provides a basis for the differentiation of microenvironments within which various soil moisture regimes control differences in soil behavior. Limiting factors, however, regulate evapotranspiration losses so that, cumulatively, spatial inequalities are diminutive. Nevertheless, seasonal divergence of soil and soil moisture conditions is sufficient to effect within-catchment differences in water disposition. Groundwater seepage and springs are more characteristic of the north-facing valley sideslope. Similarly with the recurring morphoclimatic problem of asymmetry, the maximum seasonal differences in soil condition and water disposition effect spatial differentiation in the efficiency of landforming processes over restricted parts of the annual cycle. Through a considerable time span, these differences may gain morphological expression, in the absence of overriding and countering processes. (Knapp-USGS)
W73-14831

RAINFALL EXCESS MODEL FROM SOIL WATER FLOW THEORY,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. E. Smith, and D. L. Chery, Jr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 9990, p 1337-1351, September 1973. 13 fig, 9 ref, append.

Descriptors: *Rainfall-runoff relationships, *Infiltration, Mathematical models, Computer programs, Hydraulics, Overland flow, *Soil water movement, Rainfall intensity, Antecedent precipitation, Precipitation excess, Model studies.

The complex (computer-dependent) solution of the partial differential equation for unsaturated soil moisture flow equation was used to develop a simple parametric description of the performance of a variety of soils under various rainfall input rates and patterns, and initial moisture contents. This description is expressed in terms of an infiltration model that is dependent on accumulated soil water. The model is incorporated in a kinematic model of rainfall-runoff response, and its predictions are compared with those of an empirical model of infiltration developed by the USDA Hydrograph Laboratory. The results emphasize the practical utility of the model and its potential advantages over comparable empirical models as well as the inadequate sensitivity of equipment currently used to measure rainfall and runoff from small plots. (Knapp-USGS)
W73-14836

WATER TABLE CONTROL WITH SUBSURFACE IRRIGATION,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-14858

THE BEHAVIOR OF TRITIUM IN THE SOIL,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 05B.
W73-14970

FORCED EXCHANGE OF TRITIATED WATER WITH CLAYS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 05B.
W73-14971

DYNAMIC MODEL OF WATER MOVEMENT IN SOIL UNDER VARIOUS CLIMATOLOGICAL CONDITIONS,
Puerto Rico Univ., Mayaguez. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 05B.
W73-14972

TUMBLEWEED AND CHEATGRASS UPTAKE OF TRANSURANIUM ELEMENTS APPLIED TO SOIL AS ORGANIC ACID COMPLEXES,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-14975

INDIRECT RADIOACTIVE CONTAMINATION OF THE FOOD CHAIN. DETERMINATION OF THE FACTORS OF TRANSFER, SOIL/AGRICULTURAL PRODUCE, SOIL/MILK, IN THE EUROPEAN COMMUNITY,
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
For primary bibliographic entry see Field 05B.
W73-14984

WATER-BALANCE STUDIES AND CALCULATIONS IN REGULATION OF THE MOISTURE REGIME OF EXCESSIVELY WET RECLAIMED SOILS (VODNOBALANSOVYYE ISSLEDOVANIYA L RASCHETY PRI REQULIROVANII REZHIMA UVLAZHENIYA MELIORIRUYEMYKH IZBYTOCHNO-UVLAZHNENNYKH Z EMEL'),
Belorusskii Nauchno-Issledovatelskii Institut Melioratsii i Vodnogo Khozyaistva, Minsk (USSR).
V. F. Shebeko.
Vodnyye Resursy, No 2, p 180-195, 1972. 7 fig, 1 tab, 10 ref.

Descriptors: *Land reclamation, *Saturated soils, *Soil moisture, *Water balance, *Water storage, Water table, Zone of aeration, Groundwater, Root zone, Infiltration, Evaporation, Precipitation (Atmospheric), Drainage, Wetlands, Bogs, Peat, Seasonal, Equations.
Identifiers: *USSR (Poles'ye Lowland), Water exchange.

A major problem in reclamation of excessively wet land is that of regulating soil moisture within optimal limits for normal crop growth and for high and stable yields. This problem can be solved on the basis of water-balance computations performed for individual seasons of the year. Consideration must be given to calculations of groundwater levels, infiltration, and water storage in soil layers in the zone of aeration, including the root zone. Water-balance equations for groundwater in saturated soils during the warm period of the year, winter, and spring are presented. The balance equations proposed can be used as a basis for forecasting water content in reclaimed saturated soils and for planning measures to create the required water regime in years of varying moisture. The ratio of total evaporation to precipitation on drained and undrained bogs of the Poles'ye Lowland is tabulated, and water regime in the root zone of peat cropped to perennial grasses and relation of water storage in the 0-50 cm peat layer to the groundwater level are graphed. (Josefson-USGS)
W73-15011

GENERALIZED HYDROLOGIC MODELING, A KEY TO DROUGHT ANALYSIS,
National Weather Service, Sacramento, Calif. River Forecast Center.
R. J. C. Burnash, and R. L. Ferral.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 503-514, 1973. 1 fig, 9 ref.

Descriptors: *Droughts, *Mathematical models, *Soil moisture, Groundwater, Water storage, Streamflow, Evaporation, Systems analysis.

Drought is an abnormal moisture deficiency in relation to need. This deficiency can be identified in terms of shallow rooted plants, deeper rooted plants, and water supply. A generalized hydrologic model of drought was developed for use on digital computers. This model computes soil moisture in both shallow and deeper parts of the root zones as well as groundwater storage available for streamflow generation. A drought regime does not necessarily involve all components simultaneously; the different deficiencies may have different effects. Through the use of system mechanics, local moisture deficiencies and their abnormalities may be evaluated for each requirement. (Knapp-USGS)
W73-15065

SOIL WATER CONTENT BENEATH SUMMER-DORMANT AND SUMMER-ACTIVE SWARDS IN A SEASONALLY SEMI-ARID ENVIRONMENT,
Reading Univ. (England). Dept. of Agricultural Botany.
For primary bibliographic entry see Field 02D.
W73-15169

DEW OVER INDIA AND ITS CONTRIBUTION TO WINTER-CROP WATER BALANCE,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 03F.
W73-15220

THE EMERSON DISPERSION TEST AND ITS RELATIONSHIP TO HYDRAULIC CONDUCTIVITY,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
J. Loveday, and J. Pyle.
Technical Paper No 15, p 1-7 1973. 4 fig, 8 ref.

Descriptors: *Soil analysis, *Soil physical properties, *Dispersion, *Hydraulic conductivity, Irrigation efficiency, Infiltration rates, Soil dispersants, Irrigation, Agriculture, Hydrologic models.
Identifiers: *Emerson Dispersion Test.

Soil evaluation for purposes of irrigation can be made by studying the stability of soil structure and its relationship to water infiltration and surface crusting. Details of the Emerson (1967) dispersion test, modified to make it a routine procedure for comparing the dispersability of soil aggregates, are given with a method of scoring to provide a dispersion index (DI) which involves both degree and rate of dispersion. A method for evaluating soils, especially for irrigation, should allow a first sorting of soils to reduce the requirement for hydraulic conductivity (K) measurements. With DI greater than 8, K was invariably less than 0.1 cm/hr, a value below which soils require improvement for successful irrigation agriculture. (Bahre-Ariz.)
W73-15222

FIELD SPECTROMETRIC MEASUREMENTS OF RADIONUCLIDE CONCENTRATIONS AND EXTERNAL GAMMA EXPOSURE RATES AT THE NEVADA TEST SITE, A DEMONSTRATION STUDY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 05B.
W73-15238

A METHOD FOR THE DETERMINATION OF STRONTIUM-90 AND CESIUM-137 IN RIVER SEDIMENTS AND SOILS,
Atomic Energy of Canada Ltd. Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 05A.
W73-15245

SOIL SURFACE LICHENS IN ARID AND SUB-ARID SOUTHEASTERN AUSTRALIA. III: THE RELATIONSHIP BETWEEN DISTRIBUTION AND ENVIRONMENT,
Adelaide Univ. (Australia). Dept. of Botany.
R. W. Rogers.
Australian Journal of Botany, Vol 20, No 3, p 301-316, December 1972. 8 fig, 8 tab, 7 ref.

Descriptors: *Microenvironment, *Soil microorganisms, *Lichens, *Australia, Soil environment, Arid lands, Distribution patterns, Climatic data, Precipitation (Atmospheric), Seasonal, History, Grazing.

The distribution pattern of arid zone soil surface lichens is determined from a consideration of the distribution of species and species groups in relation to soil and climatic factors. It is shown that mean annual rainfall and mean maximum January temperature largely explain the distribution pattern, with seasonal distribution of rainfall indicating that crusts tend not to occur in areas with summer rainfall, or in areas with mean maximum temperatures. Soil variables such as pH, nature of the surface, calcium concentration, and sodium concentration indicate a potential relation to distribution. A map shows the actual and potential

pattern of distribution as well as two postulated areas in which a lichen crust does not now exist because of early settlement patterns of pastoral occupation on land that had a more permanent water supply than the surrounding area, allowing for relatively intense stocking with sheep. (Bahre-Ariz.)
W73-15258

THE ECOLOGY OF SOIL-BORNE PATHOGENS,
Agricultural Univ., Wageningen (Netherlands). Instituut voor Plantenziektenkundig Onderzoek.
For primary bibliographic entry see Field 05B.
W73-15281

SOME OBSERVATIONS ON SOILS-MICROCLIMATE INTERACTIONS,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
A. R. Southard, and I. Dirmhirn.
Soil Sci Soc Am Proc. Vol 36, No 5, p 843-845. 1972. Illus.
Identifiers: Classification (Soils), Climates, *Micro climates, Radiation, *Soils (Slopes), Solar, Topography.

The environmental parameters examined were solar and scattered radiation evapotranspiration, CaCO3 equivalent, organic matter and particle size distribution. The data show a strong interaction between slope aspect or direction of exposure and soil properties. The need for careful observation of soil properties below the soil surface in selecting research sites is apparent.--Copyright 1973, Biological Abstracts, Inc.
W73-15292

2H. Lakes

PHOSPHATE RETENTION BY LAKE SEDIMENTS,
Maine Univ., Orono. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 05B.
W73-14751

ALLEVIATION OF LAKE POLLUTION BY UTILIZATION OF AQUATIC PLANTS FOR NUTRITIONAL, MEDICINAL OR INDUSTRIAL PURPOSES,
Minnesota Univ., Minneapolis. Dept. of Pharmacognosy.
For primary bibliographic entry see Field 05A.
W73-14764

DISTRIBUTION AND LEVELS OF LEAD AND ARSENIC IN GRAND TRAVERSE BAY, LAKE MICHIGAN BOTTOM SEDIMENTS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B.
W73-14781

CHEMICAL ECOLOGY OF HYDROGEN SULFIDE PRODUCTION IN FRESHWATER LAKE SEDIMENT,
Michigan Univ., Ann Arbor. Dept. of Industrial Health.
D. A. Dunnette, D. P. Chynoweth, and K. H. Mancy.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 2, p 5-13, 1973. 3 fig, 4 tab, 10 ref.

Descriptors: *Hydrogen sulfide, *Bottom sediments, *Lakes, *Decomposing organic matter, Sulfur bacteria, Water pollution effects, Eutrophication, *Michigan.
Identifiers: *Third Sister Lake (Mich).

Cysteine decomposition contributes significantly to the formation of H2S in anoxic freshwater lake sediment (a range of 5-57% was observed). Total seasonal variation in H2S production in a small unpolluted southeastern Michigan lake was 1.2-3.8 mg per liter per day at one station (15 m deep) and 1.0-2.8 at another (9 m deep) in sediment at 7 deg C. Seasonal variations were quite different at the two stations for sulfate reduction and quite similar for cysteine decomposition. Numbers of proteolytic organisms in sediment correlate well (r±0.86, 0.94) with cysteine decomposition and resulting production of hydrogen sulfide. Numbers of sulfate reducing bacteria bear an inverse relation (-0.69) to proteolytic organisms suggesting a competition for nutrients or response to toxic metabolites including H2S. Sulfate reduction does not correlate significantly with numbers of sulfate reducers, sulfate or carbon in the natural environment. Pollutional input of reducible organic carbon compounds including cysteine and protein result in dramatic increases in hydrogen sulfide production via both sulfate reduction and cysteine decomposition. (Knapp-USGS)
W73-14782

BOTTOM WITHDRAWAL OF VISCOUS STRATIFIED FLUID,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 04A.
W73-14837

VEGETATION OF THE LAKE IPEA REGION, NEW GUINEA HIGHLANDS: II. KAYAMANDA SWAMP,
Australian National Univ., Canberra. Research School of Pacific Studies.
D. Walker.
J Ecol. Vol 60, No 2, p 479-504. 1972.
Identifiers: Bryophytes, Dicots, Eutrophication, Ferns, Flora, Highlands, Inorganic matter, Lakes, Monocots, Mud, *New Guinea (Lake Ipea), *Swamps, *Vegetation.

Selected attributes of vegetation (including bryophytes, ferns, monocots, dicots) and environment of Kayamanda Swamp near Lake Ipea (Iviva) at about 2500 m above sea level in the New Guinea Highlands are described. The flora (126 taxa) classifies convincingly with or without the inclusion of 54 'rare' taxa; the classification is not maintained by reduction of the data to the quantitatively predominant plants. Many of the floristic groups have distributions related with obvious environmental variables. An analysis of the quantities of different taxa present differs only slightly from that based on presence or absence alone but provides a classification more readily correlated with environmental variety. The vegetation is best conceived as falling into 8 units each composed of a number of floristic groups in a variety of combinations. The distributions of these groups is most closely related to land:water relationships and to the degree of disturbance of pigs. Two main hydroseral sequences are hypothesized depending on the significant presence or otherwise of inorganic material in the accumulating mud; stratigraphic confirmation of these series is negligible. The future development of the swamp will be determined by the rapidity of incision by the outflowing stream, the building of banks along its course and the erosional and eutrophication effects of pigs.--Copyright 1973, Biological Abstracts, Inc.
W73-14856

EUTROPHICATION OF SHELTERED BAYS IN A LARGE LAKE,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 05C.
W73-14875

CONTROL OF RESERVOIR EUTROPHICATION,
Fairfax County Water Authority, Annandale, Va.
For primary bibliographic entry see Field 05G.
W73-14886

NEW AND RARE AQUATIC FUNGAL SPECIES ISOLATED FROM STOCK PONDS IN THE LENINGRAD REGION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
For primary bibliographic entry see Field 05C.
W73-14887

THE EFFECTS OF HARVESTING AQUATIC MACROPHYTES ON ALGAE,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.
W73-14888

EUTROPHICATION CONTROL: NUTRIENT INACTIVATION BY CHEMICAL PRECIPITATION AT HORSESHOE LAKE, WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05G.
W73-14889

LIMNOLOGICAL STUDIES ON SOME LAKES IN THE NETHERLANDS: I. A LIMNOLOGICAL RECONNAISSANCE AND PRIMARY PRODUCTION OF WIJDE BLIK, AN ARTIFICIALLY DEEPENED LAKE,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 05C.
W73-14890

MAJOR CAUSE OF ALGAE AND WEEDS IN LAKE MENDOTA,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.
W73-14895

MULTILAKE RIVER SYSTEM OPERATION RULES,
New York State Dept. of Environmental Conservation, Albany. Water Management Planning.
For primary bibliographic entry see Field 04A.
W73-14909

KINETICS OF ORTHOPHOSPHATE UPTAKE BY PHYTOPLANKTON POPULATIONS IN LAKE WINNEBAGO,
Wisconsin Univ., Madison. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-14918

PLUTONIUM IN LAKE MICHIGAN WATER,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-14977

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Arlington, Va.
E. J. Pluhowski.
Journal available from Sup Doc, GPO, Washington, D.C. 20402 Price $2.75. Journal of Research of the U.S. Geological Survey, Vol 1, No 5, p 609-614, September-October 1973. 5 fig, 3 ref.

Descriptors: *Remote sensing, *Aerial photography, *Turbidity, *Lake Ontario, Suspended load, Data collections, Hydrologic data, Path of pollutants, Industrial wastes.

High-altitude photography provides an effective method of monitoring the spatial extent of turbidity plumes in Lake Ontario. Large plumes generated by the Niagara, Genesee, and Oswego

Rivers are identifiable on photographs obtained from about 60,000 feet above the lake on July 6, 1970, October 19, 1970, and May 29, 1971. The Niagara plume, covering as much as 43 sq mi of the lake's surface, is the largest turbidity feature. The configuration of the plumes is a function of river discharge, level of turbidity, and wind speed and direction. (Knapp-USGS)
W73-14993

SPECIFIC CHARACTER OF THE STRUCTURE AND DYNAMICS OF RESERVOIR WATER MASSES (O SPETSIFICHNOSTI STRUKTURY I DINAMIKI VODNYKH MASS VODOKHRANILISHCH),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
N. V. Butorin.
Vodnyye Resursy, No 2, p 53-63, 1972. 3 tab, 16 ref.

Descriptors: *Reservoirs, Water properties, Water structure, *Water analysis, *Water quality, Water balance, Rivers, Inflow, Regulated flow, Regulation, Seasonal, Meteorology.
Identifiers: Rybinsk Reservoi.

The main objective of water analysis is to distinguish individual varieties of water and to describe their water-quality characteristics. To distinguish and describe water masses in reservoirs, a complex of physical and chemical characteristics are used: temperature, color, transparency, electrical conductance, hardness, bicarbonate concentration, and, in some cases, alkalinity, acidity, pH, and concentration of dissolved oxygen. Two fundamentally different varieties of water are present in reservoirs: river water (inflow) and reservoir water. Because of its shape, size, and character of regulated flow, the Rybinsk Reservoir in the Volga Cascade was used to study formation, distribution, and dynamics of sharply differentiated water masses. (Josefson-USGS)
W73-15008

PROBLEMS IN THE STUDY AND REGULATION OF ANTHROPOGENIC EUTROPHICATION OF WATER BODIES IN THE USSR (ZADACHI IZUCHENIYA I REGULIROVANIYA ANTROPOGENNOGO YEVTROFIROVANIYA VODOYEMOV V SSR),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 05C.
W73-15012

INVERTEBRATE MOVEMENTS AND SOME DIEL AND SEASONAL CHANGES IN A SIERRA NEVADA PEATLAND,
California Univ., Berkeley. School of Forestry and Conservation.
For primary bibliographic entry see Field 05C.
W73-15105

INFLUENCE OF MACRO-NUTRIENTS ON THE RELATIVE GROWTH OF WATER PLANTS IN THE QU'APPELLE LAKES,
Saskatchewan Univ., Regina. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-15107

REPORT ON THE WATER LEVELS OF THE GREAT LAKES.
For primary bibliographic entry see Field 06E.
W73-15165

THE GREAT LAKES BASIN: ALTERNATIVE INSTITUTIONAL ARRANGEMENTS FOR MULTI-PURPOSE RESOURCES MANAGEMENT,
Guelph Univ. (Ontario). Centre for Resources Development.
For primary bibliographic entry see Field 06E.
W73-15203

PRELIMINARY CHEMICAL STUDIES OF AQUATIC PLANTS FROM MINNESOTA,
Minnesota Univ., Minneapolis. Coll. of Pharmacy.
K. L. Su, E. J. Staba, and Y. Abul-Hajj.
Lloydia, Vol 36, No 1, p 72-79, March 1973. 3 tab, 24 ref. OWRR A-025-MINN (7).

Descriptors: *Aquatic plants, Lipids, *Minnesota, Lakes, Chemistry.
Identifiers: Alkaloids, *Flavonoids, Steroids, Nuphar variegatum, Sagittaria latifolia, Potamogeton natans.

Twenty-two aquatic plants were collected from various Minnesota lakes and studied for the presence of alkaloids, flavonoids, steroids, and lipids. Alkaloids are present in Nymphaea tuberosa and Nuphar variegatum. Flavonols and flavonones were often present in the plants studied whereas anthocyanidins and aurones were not. Beta-sitosterol was present in eight, and saponin in five of the plants studied. Cardenolides, as well as 3- and 17-oxo-steroids, were absent from the plants surveyed. Potamogeton natans, Sagittaria latifolia and N. tuberosa contained relatively higher total lipid contents (5.35, 5.24 and 3.91 weight % of dried plant material, respectively) than the other 19 species studied. (Walton-Minnesota)
W73-15229

GREAT LAKES RADIOECOLOGY,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-15239

THE USE OF NATURAL AND FALLOUT RADIONUCLIDES TO MEASURE RECENT SEDIMENTATION RATES IN SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-15240

MERCURY CONCENTRATIONS IN SEDIMENTS OF THE LAKE ERIE BASIN, OHIO.
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W73-15260

THE POPULATION DYNAMICS OF CHANNEL CATFISH, ICTALURUS PUNCTATUS (RAFINESQUE), IN THE LITTLE MISSOURI ARM OF LAKE SAKAKAWEA. BEFORE AND DURING COMMERCIAL EXPLOITATION, 1968-1971,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-15261

DATA FILE ON METAL DISTRIBUTION IN EAST AFRICAN RIFT SEDIMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W73-15262

LIMNOLOGY OF SOME MADISON LAKES: ANNUAL CYCLES,
State Univ. of New York, Buffalo. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-15287

A MIDWATER TRAWL FOR THREADFIN SHAD, DOROSOMA PETENENSE,
California State Dept. of Fish and Game, Sacramento.
C. E. Von Geldern, Jr.
Calif Fish Game. Vol 58, No 4, p 268-276, 1972.
Identifiers: *California (Lake Nacimiento), Dorosoma-Petenense, *Shad (Threadfin), *Trawl, Water trawls.

A midwater trawl designed to monitor threadfin shad abundance in restricted environments was developed at Lake Nacimiento, California, in 1966 and 1967. The trawl features hydrofoils and depressors which plane at 45 deg angles. It dives rapidly without supplementary weights or diving doors along the bridles or towing warps.--Copyright 1973, Biological Abstracts, Inc.
W73-15288

LIMNOLOGICAL STUDIES IN AN AFRICAN SWAMP: SEASONAL AND SPATIAL CHANGES IN THE SWAMPS OF LAKE CHILWA, MALAWI,
Lake Chilwa Research Project, Limbe (Malawi).
C. Howard-Williams.
Arch Hydrobiol. Vol 70, No 3, p 379-391, 1972. Illus.
Identifiers: African swamps, Lakes, Limnological studies, *Malawi (Lake Chilwa), Seasonal, Spatial changes, *Swamps, Nutrients, *Ion, Nitrates.

Seasonal changes and spatial differences in the swamps of Lake Chilwa were investigated. Changes in physical factors, water chemistry and selected soil factors are shown. A comparison between the swamp and the open lake shows that concentrations of most major ions reach high levels in the swamp when compared with the lake. High releases of nitrate were detected following flooding of the marginal soils which are dry for a period each year. The significance of these changes in the swamps is discussed with reference to the lake nutrient budget.--Copyright 1973, Biological Abstracts, Inc.
W73-15289

OCCURRENCE OF MICROORGANISMS OF DECOMPOSING ORGANIC PHOSPHORUS COMPOUNDS IN 2 TYPES OF BOTTOM SEDIMENTS OF THE EUTROPHIC LAKE JEZIORAK,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
For primary bibliographic entry see Field 05C.
W73-15293

SOME CLADOCERA AND COPEPODS FROM THE UPPER KLAMATH RIVER BASIN,
Arizona Cooperative Fishery Unit, Tucson.
For primary bibliographic entry see Field 05C.
W73-15294

ASPECTS OF THE RECOVERY OF A SALINE AFRICAN LAKE FOLLOWING A DRY PERIOD,
Newcastel-upon-Tyne Univ. (England). Dept. of Zoology.
A. J. McLachlan, P. R. Morgan, C. Howard-Williams, S. M. McLaughlin, and D. Bourn.
Arch Hydrobiol. Vol 70, No 3, p 325-340. 1972. Illus.
Identifiers: African lakes, Dry period, Lakes, *Malawi (Lake Chilwa), *Saline lake recovery, *Endorheic lakes.

Lake Chilwa, a shallow, endorheic lake in Central Africa (Malawi), recently refilled after being virtually dry over a year. The refilling, which was completed in 5 mo., was associated with a rapid dilution of initially high levels of dissolved salts and a high suspended sediment load resulting from erosion of the lake bottom. Over a 2 yr period following refilling (Dec. 1968 to Dec. 1970) there was a significant decrease in water turbidity accompanied by the deposition of a fine-grained silt blanket. Particular attention was given to horizontal variations in mud and water during the original filling and in subsequent seasonal cycles. The his-

tory of the lake during its recovery was compared with the situation when the lake was drying out. Some biological characteristics of the recovery regime and the probable course of events until the next dry period are considered.--Copyright 1973, Biological Abstracts, Inc.
W73-15296

HYDROGRAPHICAL DATA FROM 2 SOFT WATER LAKES WITH SPECIAL REFERENCE TO PRECIPTIATION (MELT WATER),
Oslo Univ. (Norway). Dept. of Limnology.
O. Groterud.
Arch Hydrobiol. Vol 70, No 3, p 277-324. 1972. Illus.
Identifiers: Hydrographical data, Lakes, *Norway, *Precipitation, *Soft water lakes, *Melt water, Iron.

The 2 investigated lakes, Sandtjern and Ovre Heimdalsvatn, Norway, are poor in electrolytes, and they developed a clinograde O2 distribution during winter with accumulation of salts, especially Fe, in the deep water. The precipitation in both lake areas showed pH values between 4 and 5. The relation between pH and SO4 indicates H2SO4 in the precipitation. The hydrography of Sandtjern indicates a close connection to the precipitation, especially to the melt water. Ovre Heimdalsvatn seems also to be affected by the precipitation, but is in addition influenced by the drainage area.--Copyright 1973, Biological Abstracts, Inc.
W73-15299

2I. Water in Plants

THE RADIATION AND ENERGY BALANCES OF CONIFEROUS AND DECIDUOUS FORESTS,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
S. J. Tajchman.
J Appl Ecol. Vol 9, No 2, p 359-375, 1972. Illus.
Identifiers: *Coniferous forests, *Deciduous forests, *Energy balance, Forests, Humidity, Radiation, Spruce, Temperature, Transpiration, Wind.

A method is described for evaluation of profile-measurements above a vegetation cover in order to calculate its energy balance. The equations given by the aerodynamic and by the Bowen ratio methods for calculating evapotranspiration and sensible heat fluxes from the forest are applicable if the experimental site satisfies the theoretical specifications. The levels of maximum values of temperature and specific humidity lie much higher than the zero plane displacement for wind profile (day time), and the log-law does not fit the experimental data on temperature and humidity profiles above the forest. The energy balance of a spruce forest during the growing season was studied and compared with that of a deciduous forest. The difference in a seasonal course of the radiation and energy balances of both types of forests is mainly caused by albedo changes of a deciduous forest. In 2 definite examples, it was shown how the structure of the forest influences the vertical profiles of radiation density, transpiration and sensible heat fluxes within the canopy. The experimental data on radiation flux density within the forest canopy agree with theoretical results only when the sun elevation is greater than 45 deg.--Copyright 1973, Biological Abstracts, Inc.
W73-14870

SOME EFFECTS OF SOIL WATER TABLES ON THE GROWTH OF SITKA SPRUCE IN NORTHERN IRELAND,
Ministry of Agriculture, Belfast (Northern Ireland). Chemistry and Animal Nutrition Research Div.
S. N. Adams, D. A. Dickson, and I. S. Cornforth.
Forestry (Oxf). Vol 45, No 2, p 129-133. 1972.
Identifiers: Depth, Drainage, Growth, *Ireland, Picea-Sitchensis, Rooting, Sitka, *Soil water, *Spruce, Texture.

Soil water tables and the rooting depth of trees were studied in 2 areas of gleyed soils in Lisnaskea Forest, Fermanagh, Ireland, where growth of Sitka spruce (Picea sitchensis Carr.) is far from uniform. On both areas, poor tree growth is associated with high water tables and shallow rooting. Soils under good trees had a sandy-textured horizon associated with rotten rock fragments. This horizon could improve drainage conditions and must have been present before planting. High soil water tables are a cause rather than a consequence of poor tree growth.--Copyright 1973, Biological Abstracts, Inc.
W73-14898

GROWTH CHARACTERISTICS OF OPUNTIA IMBRICATA (HAW.) DC. IN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Animal, Range and Wildlife Sciences.
J. G. Fraser, and R. D. Pieper.
Southwest Nat. Vol 17, No 3, p 229-237, 1972. Illus.
Identifiers: *Cholla growth, Moisture, *New Mexico, Opuntia-imbricata, Rainfall, Soils.

Growth of O. imbricata (Haw.) DC. was studied by periodically measuring lengths of new branches during the growing season. During 1967, when rainfall was plentiful, large and medium plants grew at a faster rate than small plants. However, during 1968 when rainfall was below average, the growth rate differed little among plants of different size classes. Cholla began growth earlier in the season than herbaceous vegetation and completed growth while herbaceous plants were still actively growing. Cholla growth was only slightly correlated with soil moisture while herbaceous production was correlated with soil moisture content at three depths. Direct competition for moisture between cholla and herbaceous vegetation may be minimized by differences in growth periods and utilization of different sources of moisture for growth.--Copyright 1973, Biological Abstracts, Inc.
W73-14954

TUMBLEWEED AND CHEATGRASS UPTAKE OF TRANSURANIUM ELEMENTS APPLIED TO SOIL AS ORGANIC ACID COMPLEXES,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-14975

TRITIUM UPTAKE AND LOSS IN GRASS VEGETATION WHEN EXPOSED TO AN ATMOSPHERIC SOURCE OF TRITIATED WATER,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-14976

A PATTERN OF MUSKEG--A KEY TO CONTINENTAL WATER,
New Brunswick Univ., Fredericton. Muskeg Research Inst.
For primary bibliographic entry see Field 02C.
W73-15005

SALT TOLERANCE AND CATION INTERACTION IN ALKALI SACATON AT GERMINATION,
Sind Univ., Hyderabad (Pakistan). Dept. of Botany.
For primary bibliographic entry see Field 03C.
W73-15215

SALINITY, PLANT GROWTH, AND METABOLISM,
Western Australia Univ., Nedlands. Dept. of Agronomy.
For primary bibliographic entry see Field 03C.
W73-15218

PRODUCTIVITY OF AN ARID ZONE SHRUB (EREMOPHILA GILESII) COMMUNITY IN SOUTH-WESTERN QUEENSLAND,
Charleville Pastoral Lab. (Australia).
W. H. Burrows.
Australian Journal of Botany, Vol 20, No 3, p 317-329, December 1972. 8 tab, 45 ref.

Descriptors: *Productivity, *Biomass, *Shrubs, *Phosphorus, *Litter, Desert plants, Rainfall, Distribution patterns, Organic matter, Degradation (Decomposition), Yield equations, Evaporation, Measurement, Climatic data, Abiotic environment, *Australia.

Data collected over a period of a year on the above-ground biomass of a monospecific Eremophila gilesii shrub community (69,200 bushes/ha including seedlings) showed a mean value of 2106 kg/ha (range 1502/2402 kg/ha) over a year of measurement. Above-ground primary production (biomass increment and litter fall) average 0.23 g/m2/day. Rainfall utilization represented 3700 g water/g above-ground dry matter produced. A comparison with other Australian arid zone shrub vegetation of similar biomass reveals that the proportion of the total nitrogen and phosphorus pool incorporated in the organic matter is high. Rainfall produced the greatest litter; with a variation measured throughout the rest of the year. Average litter breakdown time was estimated to be 20 months; but along with decomposition, accounted for the release of up to 0 deg 33 kg organic phosphorus per hectare each year. About 53% of the phosphorus content in green leaves is extracted before abscission for redistribution within the plant. Well over half the phosphorus required for the above-ground production each year is provided by the intrinsic and extrinsic sources of organic phosphorus. The results are discussed in relation to the possible center or origin of Eremophial and the adaptation of E. gilesii to its harsh abiotic environment. (Bahre-Ariz.)
W73-15219

BRAZILIAN GROUND WATER CRUSTACEA: 1. STUDIES ON THE GENERA PARASTENOCARIS KESSLER AND FORFICATOCARIS JAKOBI FROM SERRA DO MAR OF SAO PAULO (COPEPODA, HARPACTICOIDEA), (IN GERMAN),
Kiel Univ. (West Germany).
W. Noodt.
Crustaceana (Leiden). Vol 23, No 1 , p 76-99, 1972, Illus, (English summary).
Identifiers: *Brazil (Serra do Mar), Copepoda, Crustacea, *Forficatocaris, Forficatocaris-Claudii, Forficatocaris-Evelinae, Forficatocaris-Jakobii, Forficatocaris-Lilianae, Genera, Geography, Harpacticoidea, *Parastenocaris, Parastenocaris-Divae, Parastenocaris-Tageae, Species, Zooplankton.

Six new species of the family Parastenocarididae, from interstitial groundwater along streams on the slope of the Serra do Mar of Sao Paulo, are described. Parastenocaris divae and P. tageae belong to the remanei-group. Forficatocaris claudii, F. lilianae, F. evelinae and F. jakobii form a separate species group which probably is closely related to F. forficata (Noodt) from Santarem. The biogeography of the species of Forficatocaris, which is endemic to the Neotropical Region, and of those of the remanei-group of Parastenocaris, is discussed briefly.--Copyright 1973, Biological Abstracts, Inc.
W73-15277

ETERMINATION OF XYLEM TENSIONS IN HE CROWN OF A GIANT SEQUOIA: EQUOIADENDRON GIGANTEUM,
ochschule fuer Bodenkultur, Vienna (Austria).
otanisches Institut.
. Holzner.
ora (Jena). Vol 116, No 4, p 401-420, 1972, Illus, nglish summary).
entifiers: *Sequoia (Giant), Sequoiadendron-Giiteum, Sun, *Xylem tensions, Trees.

cholander's pressure chamber technique was ed for determining suction tensions (±xylem ater potentials) in the crown of a giant sequoia, giganteum (Lindl.) Buchholz. The influence of peated cutting on readings was found to be conderable, when 20 min had elapsed between tachment of a branch and removal of a piece of em. Equilibrium pressures became smaller in teral shoots removed after some time from cut anches, indicating a withdrawal of the water olumn from the first cutting, probably through ater uptake by leaf cells. Excessive trimming of anches and gradual detachment of small twigs om cut branches are not recommended, therere, unless immediately after the first cutting. aily fluctuations of suction tension at 7 m above e ground show a good agreement between vapor essure deficits calculated from meteorological ata and tensions in shaded twigs. Xylem tensions twigs exposed to full sunlight gradually rise over e shadow curve from morning to noon, reaching maximum difference of approx 7 atm. Minimum nsions are observed shortly before sunrise. Tenon gradients from the lowest branches (7 m bove ground) to the top (24-48 m) show only a ow rise when transpiration is reduced, especially mediately before sunrise. During the day, they e steeper in the shade (e.g., under cloudy sky) an in full sunshine. Measurements of potential smotic pressures indicate that twigs in the top of e crown are unable to heighten their tensions as uch as low twigs because of osmotic difficulties. hese are overcome in winter and early spring, hen potential osmotic pressures are high and perit very steep gradients in full sun.--Copyright 973, Biological Abstracts, Inc.
V73-15279

TUDY OF THE HELMINTH FAUNA OF OMESTIC ANIMALS IN AREA OF DANUBE OWER STATION: III. HELMINTH FAUNA OF VATER FOWLS IN ZITNY OSTROV (CZECHOSLOVAKIA). (IN CZECH),
lovenska Akademie Vied, Kosice (Cechoslovakia). Helmintologicky Ustav.
. Busa.
tud Helminthol. 2 p 49-54. 1968, (English summay).
dentifiers: Amidostomum-Anseris, Anomotaenia-Ciliata, Bilharziella-Polonica, Capillaria-Anseris, Czechoslovakie (Zitneg Ostrov), *Danube, Power station, Domestic animals, Drepanidotaenia-Lanceolata, Ducks, Echinostoma-Revolutum, Ecology, Fauna, Fowls, Goose, *Helminth, Philophthalmus-Hovorkai, Polymorphus-Magnus, Porrocaecom-Crassum, Power stations, Thominx-Contorta.

The most frequent trematode species in the region of the Zitny Ostrov are Bilharziella polonica and Echinostoma revolutum occuring in the duck. In geese, the relatively frequent occurrence of a new trematode species Philophthalmus hovorkai was reported. The most frequently occurring cestode of ducks was Anomotaenia ciliata, whereas Drepanidotaenia lanceolata was most frequent in geese. Thominx contorta and Porrocaecum crassum are the most common nematodes of ducks; Amidostomum anseris and Capillaria anseris were most frequent in geese. Polymorphus magnus was found in ducks. Both hosts present relatively severe helminth infestations (ducks 92.1%, geese 97.9%). In ducks nematodes and trematodes are the most frequently occurring helminth species (82.6 and 65.8%, respectively). In geese nematode infestations occur most frequently (95.7%), then follow cestode infestations (17.0%). The helminth status of both ecological categories, biohelminths (21 species) and geohelminths (4 species), indicates conditions which are particularly favorable for biohelminths.--Copyright 1973, Biological Abstracts, Inc.
W73-15280

REGULATION OF STOMATAL APERATURE IN ISOLATED EPIDERMAL PEELINGS OF CITRULLUS COLOCYNTHIS (LINN.) SCHRAD, WITH PHENYLMERCURIC ACETATE AND POTASSIUM CHLORIDE,
Jodhpur Univ. (India). Dept. of Botany.
M. C. Bhandari, and David N. Sen.
Biochem Physiol Pflanz (BPP). Vol 163, No 3, p 320-323, 1972, Illus.

Descriptors: Acetates, Chlorides, Citrullus-Colocynthis, Epidermal, Isolated, Light, Mercuric compounds, Peelings, Potassium, Regulation, *Stomaal aperature, Toxicity.

Both KC1 and phenylmercuric acetate (PMA) remained ineffective in bringing about opening or closure of stomatal aperatures, respectively, in total darkness. PMA failed to close the stomatal aperture in the presence of K+ ions in guard cells. The induction of smaller stomatal aperture by KC1 after PMA in light appeared to be due to some injurious or toxic effect of the latter on guard cells in the isolated epidermal strips of C. colocynthis.--Copyright 1973, Biological Abstracts, Inc.
W73-15282

INTERACTIONS OF POTASSIUM CHLORIDE AND TWO ANTITRANSPIRANTS ON STOMATAL REGULATION IN ISOLATED LEAF EPIDERMAL STRIPS OF TEPHROSIA PURPUREA PERS,
Jodhpur Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 02D.
W73-15284

2J. Erosion and Sedimentation

PHOSPHATE RETENTION BY LAKE SEDIMENTS,
Maine Univ., Orono. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 05B.
W73-14751

DISTRIBUTION AND LEVELS OF LEAD AND ARSENIC IN GRAND TRAVERSE BAY, LAKE MICHIGAN BOTTOM SEDIMENTS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B.
W73-14781

CHEMICAL ECOLOGY OF HYDROGEN SULFIDE PRODUCTION IN FRESHWATER LAKE SEDIMENT,
Michigan Univ., Ann Arbor. Dept. of Industrial Health.
For primary bibliographic entry see Field 02H.
W73-14782

TEXTURAL TREND ANALYSIS OF COASTAL BARRIER SEDIMENTS ALONG THE MIDDLE ATLANTIC BIGHT, NORTH CAROLINA,
Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences.
G. L. Shideler.
Sedimentary Geology, Vol 9, No 3, p 195-220, June 1973. 7 fig, 2 tab, 20 ref. Old Dominion Univ. Grant GR-71.

Descriptors: *Sedimentation, *Barrier islands, *Beaches, *North Carolina, *Sedimentary structures, Particle size, Winds, Dunes, Currents (Water), Littoral drift, Statistics, Sediment transport, Provenance, Stratigraphy, Analysis.
Identifiers: *Trend analysis.

Comparative polynomial trend analyses of textural parameters were conducted on adjacent foreshore, berm, and dune sediment populations along a coastal barrier chain of the Middle Atlantic Bight. Systematic textural patterns exhibited by the barrier sediments consist of both regional trends and local cyclicity. The regional trends reflect progressive variability of both the hydraulic and aeolian regimes. Variability of the hydraulic regime consists of a progressive southward increase in average wave energy, with a concomitant decrease in energy consistency; this is attributed to the coastal wave refraction pattern, and to a progressive southward decrease in shelf width. The aeolian regime is characterized by a constant average energy level along the barrier chain, but exhibits a progressive northward decrease in wind energy consistency, and a corresponding increase in winnowing efficiency. Local cyclicity along the barrier reflects textural variations in the barrier source materials excavated from a heterogeneous Pleistocene substrate. The cyclic patterns suggest the presence of a buried ancestral Albemarle fluvial channel near the present mouth of albemarle Sound. In developing systematic textural variations along the barrier, size characteristics of the source material are the most influential factor, while the influences of both the hydraulic and aeolian regimes are subordinate. The berm and dune field environments are most amenable to the development of systematic variation, while the foreshore is most susceptible to random component variation. (Knapp-USGS)
W73-14810

MARINE GEOLOGY OF THE ALEUTIAN ABYSSAL PLAIN,
Naval Undersea Research and Development Center, San Diego, Calif.
E. L. Hamilton.
Marine Geology, Vol 14, No 5, p 295-325, June 1973. 16 fig, 2 tab, 50 ref, append.

Descriptors: *Bottom sediments, *Pacific Ocean, *Sedimentation, *Marine geology, Oceanography, Provenance, Turbidity currents, Stratigraphy.
Identifiers: *Aleutian Abyssal Plain.

The Eocene-Oligocene, turbidite Aleutian Abyssal Plain was deposited from channelized turbidity currents from the north or northeast. The plain is bounded on the south by the northern ridges of the Surveyor Fracture Zone, and is isolated from the Tufts Abyssal Plain. Turbidities were deposited from many buried channels and smaller surficial channels, but mainly from four great channels: Seamap, Sagittarius, Aquarius, and Taurus. The channels are depositional features; accumulation of sediments causes the channels to lie, topographically, along low ridges, with channels above distal portions of their levees. Western levees are higher and broader than eastern levees. Levee heights decrease from 30-100 m in the north to 15-25 m in the south. Rates of deposition and thicknesses of pelagic sediments in the northwest are 3 to 4 times greater than in the southeast. The sediment source was probably Alaska. The evidence is consistent with concepts of discontinuous sea-floor spreading with episodic subduction, or discontinuous, relative plate motion in this area. (Knapp-USGS)
W73-14811

OBSERVATIONS OF SHALLOW LAYERING UTILIZING THE PINGERPROBE ECHO-SOUNDING SYSTEM,
Texas Univ., Galveston. Earth and Planetary Sciences Div.
M. Ewing, R. W. Embley, and T. H. Shipley.

Marine Geology, Vol 14, No 5, p M55-M63, June 1973. 5 fig, 13 ref. USNR N00014-67-A-0108-0004 NSF-29460 and NSF GX-30675.

Descriptors: *Sounding, *Bottom sediments, Acoustics, Sonar, *Instrumentation, Hydrography, Surveys, Stratigraphy, *Sounding, Measurement.
Identifiers: *Pingerprobe.

A Pingerprobe is a system of echo sounding in which the sound source is placed near bottom to improve resolution by restricting the area investigated. A commercially available 12-kHz pinger with a synchronized shipboard receiver is useful not only in the monitoring of the positioning of a bottom or near-bottom instrument package (such as a corner) but also in making observations on the acoustic nature of the sea floor. In rough terrain the Pingerprobe can measure stratified sediments in some places where the precision depth recorder cannot. Observations on proximal abyssal plains indicate that the prolonged echo character common to these areas may result from small-scale roughness or inhomogeneity. When a suspended instrument is sent to the bottom in rough terrain, or in areas of intermittent subbottom reflections, use of a Pingerprobe improves information about the conditions at the point of contact and permits selection of the desired topographic setting. (Knapp-USGS)
W73-14812

SUSPENDED SEDIMENT TRANSPORT FROM THE GIRONDE ESTUARY (FRANCE) ONTO THE ADJACENT CONTINENTAL SHELF,
Institut de Geologie du Bassin d'Aquitaine, Talence (France).
For primary bibliographic entry see Field 02L.
W73-14813

THE BOTTOM SEDIMENTS OF THE AMAZON SHELF AND TROPICAL ATLANTIC OCEAN,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
R. J. Gibbs.
Marine Geology, Vol 14, No 5, p M39-M45, June 1973. 6 fig, 9 ref. ONR Contract N00014-67-A-0356-0011.

Descriptors: *Sediment transport, *Continental shelf, Sedimentation, *South America, Sedimentology, Rivers, Bed load, Suspended load, Mud, Silts, *Bottom sediments.
Identifiers: *Amazon River.

Results of bottom sampling of the parts of the Atlantic Ocean affected by the Amazon River show a concentration of material smaller than 2 micrometers along the shore northwest of the mouth of the Amazon River for 2000 km. A zone having a high percentage of material coarser than 20 micrometers extends outward from the Amazon River and along the outer continental shelf northwestward for 2000 km. Areas having high carbonate percentages are encountered only on the outer shelf and in deep water. The high carbonate percentages in the bottom sediments of the study area obviously reflect biological activity and represent the ecological conditions favorable for growth of carbonate-secreting creatures. The distribution of the terrigenous sediments is contrary to classical theories inasmuch as a mud zone along the shore grades seaward to a silt-and-sand zone. Apparently, silts and sands are not only moved across the wide continental shelf, but some are then transported northwestward along the shelf. (Knapp-USGS)
W73-14814

A CHENIER SEQUENCE AT BROAD SOUND, QUEENSLAND, AND EVIDENCE AGAINST A HOLOCENE HIGH SEA LEVEL,
Bureau of Mineral Resources, Geology and Geophsics, Canberra (Australia).
For primary bibliographic entry see Field 02L.
W73-14815

SIMILARITIES BETWEEN MN, NI AND CO CONTENTS OF DEEP-SEA CLAYS AND MANGANESE NODULES FROM THE SOUTH-WEST REGION OF THE NORTH ATLANTIC,
Liverpool Univ. (England). Dept. of Oceanography.
R. Chester, L. R. Johnson, R. G. Messiha-Hanna, and R. C. Padgham.
Marine Geology, Vol 14, No 4, p M15-M20, May 1973. 1 fig, 2 tab, 13 ref.

Descriptors: *Manganese, *Nickel, *Cobalt, *Bottom sediments, *Atlantic Ocean, Clays, Mineralogy, Water chemistry, Chemical precipitation, Sedimentation.
Identifiers: *Manganese nodules.

In the Atlantic Ocean Mn, Ni and Co tend to be concentrated in those deep-sea sediments deposited in a central zone which extends down the length of the ocean. These trace elements are also concentrated in clays in the southwest region of the North Atlantic. This region is rich in manganese nodules, and the nonlithogenous fractions of some of the clays approximate to those of the nodules in composition. It is suggested that these clays have acquired their relatively high concentration of nonlithogenous trace elements from seawater by processes associated with the formation of manganese nodules. (Knapp-USGS)
W73-14816

SUSPENDED MATTER IN SURFACE WATERS OF THE EASTERN GULF OF GUINEA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02L.
W73-14817

HISTORY AND SAND BUDGETS OF THE BARRIER ISLAND SYSTEM IN THE PANAMA CITY, FLORIDA, REGION,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-14818

OXYGEN UPTAKE OF BOTTOM SEDIMENTS STUDIED IN SITU AND IN THE LABORATORY,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 05B.
W73-14822

COMPARISON OF RADIOACTIVE GLASSES OF SCANDIUM AND IRIDIUM AS TRACERS IN SEDIMENT-TRANSPORT STUDIES,
Bhabha Atomic Research Center, Bombay (India). Isotope Div.
K. Krishnamurthy, and S. M. Rao.
Journal of Hydrology, Vol 19, No 3, p 189-204, July 1973. 6 fig, 7 tab, 8 ref.

Descriptors: *Tracers, *Sediment transport, *Radioactivity techniques, Bed load, Tracking techniques, Radioisotopes, Sedimentology, Sedimentation.
Identifiers: *Iridium radioisotopes, *Scandium radioisotopes.

A systematic comparison was made of all important criteria for the selection of either scandium-46 or iridium-192 as a radioisotopic glass tracer for bed-load transport studies in rivers and estuaries. Sc-46 provides about 40% more count rate than Ir-192 for equal activities on the surface of the bed. This discussion leads to the conclusion that except for ease of transportation to the worksite, Sc-46 appears preferable to Ir-192. The use of Sc-46 provides higher detection sensitivity with less effect on the response due to the variations in the bed-detector distance. (Knapp-USGS)
W73-14826

THE INFLUENCE OF SLOPE ORIENTATION UPON THE SOIL MOISTURE REGIME, AND ITS HYDROGEOMORPHOLOGICAL SIGNIFICANCE,
Birkbeck Coll., London (England)
For primary bibliographic entry see Field 02G.
W73-14831

THEORIES AND RELATIONSHIPS OF RIVER CHANNEL PATTERNS,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 02E.
W73-14833

SEDIMENTATION IN MANGLA RESERVOIR,
Harza Engineering Co., Chicago, Ill. Industrial Basin Div.
R. W. Szechowycz, and M. M. Qureshi.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 10033, p 1551-1572, September 1973. 7 fig, 10 tab, 13 ref.

Descriptors: *Sedimentation, *Reservoir silting, *Sedimentation rates, Bed load, Suspended load, Deltas, Reservoir storage, Sediment transport, Sediment yield.
Identifiers: *Pakistan (Mangla Dam).

Mangla Dam is located in Jhelum River in West Pakistan. Studies of reservoir sedimentation during the investigation and design period indicated that the proposed capacity of the Mangla Reservoir will be substantially larger than the volume of sediment that will be brought into the reservoir during its economic life. Due to the peculiar topographic configuration of the reservoir area, depletion of storage may not take place at a uniform rate and a substantial portion of the useful storage might be isolated by the accumulation of sediments. A method was developed for predicting the rate of storage depletion and estimating the life of the project. In this context the total annual sediment inflow, the estimate of unit weight of sediment deposits, formation of 'deltas,' and the procedures used in distribution of sediments in the Mangla Reservoir were examined. (Knapp-USGS)
W73-14845

BASIC PATTERNS IN MOVEMENT OF FLUVIAL SEDIMENTS (OSNOVNYYE ZAKONOMERNOSTI DVIZHENIYA RECHNYKH NANOSOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
K. I. Rossinskiy, and K. S. Lyubomirova.
Vodnyye Resursy, No 1, p 95-118, 1972. 12 fig, 12 ref.

Descriptors: *Fluvial sediments, *Sediment transport, *Traction, *Saltation, *Suspension, Suspended solids, Bottom sediments, Sediment discharge, Movement, Flow, Velocity, Settling velocity, Particle size, Gravels, Hydraulics, Equations, Curves.
Identifiers: USSR.

The transport of sediments in streams is classified in three ways: (1) traction, (2) saltation, and (3) suspension. A theoretical analysis is made of each type of movement, and a formula is proposed for relating total discharge of homogeneous and inhomogeneous bottom and suspended sediments to hydraulic characteristics of flow. (Josefson-USGS)
W73-14850

MERCURY CONCENTRATIONS IN DATED VARVED MARINE SEDIMENTS COLLECTED OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 05B.
W73-14937

INSTRUMENTATION FOR MEASUREMENT OF BEACH WATER-TABLE FLUCTUATIONS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14986

THE WATER TABLE AS A RESPONSE VARIABLE OF THE SYSTEM,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14987

CHANGES IN FORESHORE SAND VOLUME ON A TIDAL BEACH: ROLE OF FLUCTUATIONS IN WATER TABLE AND OCEAN STILL-WATER LEVEL,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14988

GROUNDWATER FLOW IN A SANDY TIDAL BEACH. 1. ONE-DIMENSIONAL FINITE-ELEMENT ANALYSIS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14989

SUSPENDED SEDIMENT OBSERVATIONS FROM ERTS-1,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-15002

DISTRIBUTION, TRANSPORT, AND COMPOSITION OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 02L.
W73-15004

A ROTARY SIEVE FOR REMOVING MUD FROM BOTTOM DEPOSIT SAMPLES,
Glasgow Univ. (Scotland).
For primary bibliographic entry see Field 07B.
W73-15210

THE USE OF NATURAL AND FALLOUT RADIONUCLIDES TO MEASURE RECENT SEDIMENTATION RATES IN SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-15240

A METHOD FOR THE DETERMINATION OF STRONTIUM-90 AND CESIUM-137 IN RIVER SEDIMENTS AND SOILS,
Atomic Energy of Canada Ltd. Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 05A.
W73-15245

FEATURES OF CROSS-STRATIFIED UNITS DUE TO RANDOM AND OTHER CHANGES IN BED FORMS,
Reading Univ. (England). Sedimentology Research Lab.
J. R. L. Allen.
Sedimentology, Vol 20, No 2, p 189-202, May 1973. 4 fig, 1 tab, 35 ref.

Descriptors: *Beds (Stratigraphic), *Sedimentary structures, *Sedimentation, *Alluvial channels, Ripple marks, Erosion, Sedimentology, Model studies, Hydraulic models, Flumes.
Identifiers: Cross-stratification.

Because cross-stratified units depend upon the movement of bed forms, any change in the shape, size and direction of travel of the forms is reflected in the geometry of the units, notably in their relative length, breadth and thickness, mode of termination upstream and downstream, and internal discontinuities. Changes in bed forms occur at two levels of detail indcpendently. Those at the coarser level depend on the essential nonuniformity, unsteadiness and multidirectionality of natural flows. At the finer level, change is related to the random behavior of individual bed forms as they interact with the adjacent flow, and change proceeds even when the flow is at equilibrium. The streamwise length of bed forms and their upstream and downstream erosional termination, is governed by the lifespan of individual ripples and by the extent of net deposition on the bed. Internal discontinuities depend on the relative motion of ripples, no change of flow discharge and stage being involved. The degree of relative motion in the ripple assemblages was substantial in the flume tests. (Knapp-USGS)
W73-15259

MERCURY CONCENTRATIONS IN SEDIMENTS OF THE LAKE ERIE BASIN, OHIO.
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W73-15260

DATA FILE ON METAL DISTRIBUTION IN EAST AFRICAN RIFT SEDIMENTS,
Woods Hole Oceanographic Institution, Mass.
E. T. Degens, and G. Kulbicki.
Available from NTIS, Springfield, Va. 22151 as PB-220 118; Price $3.00 printed copy; $1.45 microfiche. Report WHOI-73-15, March 1973. 255 p, 8 ref. ACS-Pet. Res. Fund Grant PRF-1943-A.

Descriptors: *Metals, *Lake sediments, *Data collections, *Africa, Sampling, Core drilling, Cores, Chemical analysis, Bottom sediments, Trace elements, Water analysis, Water chemistry.
Identifiers: *East African Rift Lake sediments, Lake Tanganyika (Africa), Lake Kivu (Africa), Lake Edward (Africa), Lake Albert (Africa).

Data are presented on chemical composition of East African Rift Lake sediments. Included are water analyses of major ions and nutrients present in Lakes Tanganyika, Kivu, Edward and Albert. The data file is organized in the following manner: List of sediment samples (Station No., Lab. Reg. No., Core Depth); spectrometric analyses (raw data); list of various statistic parameters (mean values, standard deviation, etc.); varimax factor matrix; factor scores (data outprint); factor scores (graph outprint); organic carbon, nitrogen and $CaCO_3$ analyses; water analyses, and graphical representation of data. (Woodard-USGS)
W73-15262

PEBBLE SEGREGATION AND BED LENTICULARITY IN WAVE-WORKED VERSUS ALLUVIAL GRAVEL,
Geological Survey, Menlo Park, Calif.
H. E. Clifton.
Sedimentology, Vol 20, No 2, p 173-187, May 1973. 9 fig, 2 tab, 39 ref.

Descriptors: *Gravels, *Sedimentary structures, *Sediment sorting, *Ripple marks, Sedimentation, Sedimentology, Alluvium, Beaches, Waves (Water), Currents (Water), Stratigraphy, Beds (Stratigraphic).

Two aspects of bedding may permit visual discrimination between wave-worked and alluvial gravel. Pebbles in gravel worked by waves tend to be better segregated into discrete beds than those in alluvial deposits, and bedding in wave-worked gravel tends to be more laterally regular or less lenticular than that in stream gravel. Pebble segregation and lenticularity were quantitatively analyzed in 25 different marine and fluvial deposits of Quaternary or Tertiary age in southwestern Oregon in order to evaluate their use as environmental indicators. These two factors combined provide a visual criterion for discriminating between many gravels of wave-worked and alluvial origin. (Knapp-USGS)
W73-15263

AN APPRAISAL OF THE COMPUTATION OF STATISTICAL PARAMETERS IN GRAIN SIZE ANALYSIS,
Unit of Coastal Sedimentation, Taunton (England).
B. L. Seward-Thompson, and J. R. Hails.
Sedimentology, Vol 20, No 1, p 161-169, February 1973. 4 fig, 2 tab, 6 ref.

Descriptors: *Particle size, *Statistical methods, *Computer programs, Sampling, Sediments, Sedimentology.

A computer program was written to compute statistical parameters in grain-size analysis. This program uses all available data obtained from standard sedimentological analyses, regardless of phi interval, and computes statistical parameters by direct integration of a linear approximation to the cumulative curve. This has the advantage that the distribution curve is known and hence the limitations of the parameters obtained can be assessed. Furthermore, this approximation introduces no greater degree of inaccuracy than is already present in standard sampling and analytical procedures. (Knapp-USGS)
W73-15264

PRECIPITATION AND LITHIFICATION OF MAGNESIAN CALCITE IN THE DEEP-SEA SEDIMENTS OF THE EASTERN MEDITERRANEAN SEA,
Woods Hole Oceanographic Institution, Mass.
J. D. Milliman, and J. Muller.
Sedimentology, Vol 20, No 1, p 29-45, February 1973. 8 fig, 2 tab, 38 ref.

Descriptors: *Calcite, *Chemical precipitation, Sedimentation, Magnesium, Dolomite, Limestones, Calcium carbonate.
Identifiers: *Mediterranean Sea.

Magnesian calcite is an important sedimentary component in the deep-sea sediments of the eastern Mediterranean Sea, about 20%-50% of the carbonates in most areas. The lack of any obvious biogenic source, plus similarities with magnesian-rich lutites from the Red Sea and deep-sea cements from other areas suggest that this magnesian calcite was precipitated inorganically. Although the exact mode of precipitation is not understood at present, it probably occurred at the water-sediment interface under elevated salinity and temperature conditions, such as those present in the modern eastern Mediterranean. Precipitation did not occur during periods of lower temperatures and/or salinities such as during the stagnant conditions caused by the influx of freshwaters from melting Pleistocene glaciers. The eastern Mediterranean magnesium-rich sediments appear to represent an intermediate stage between normal deep-sea sediments and those from the warm hypersaline Red Sea. Normal deep-sea carbonates are composed almost entirely of biogenic calcite, whereas the Red Sea magnesian calcite alternates with layers of aragonite that were precipitated under elevated salinity and temperature conditions brought about by lowered stands of sea level. (Knapp-USGS)
W73-15265

SEDIMENTARY ENVIRONMENTS OF THE EAST-CENTRAL BERING SEA CONTINENTAL SHELF,
Washington Univ., Seattle. Dept. of Oceanography.
H. J. Knebel, and J. S. Creager.
Marine Geology, Vol 15, No 1, p 25-47, August 1973. 7 fig, 1 tab, 56 ref.

Descriptors: *Sedimentation, *Sediment transport, *Alaska, Statistical methods, Statistics, Sea ice, Sediment sorting, Bottom sediments, Currents (Water), Tides, Particle size.
Identifiers: Factor analysis.

A factor analysis of 180 bottom sediment samples from the east-central Bering Sea continental shelf identifies five factors that account for 95% of the variation in the 17 whole phi size classes that were used as variables. Factor I represents coarse sediments that have been bypassed in areas of active water circulation. Factors II and III represent fine and very fine sands that have been hydraulically sorted, reworked, and mixed. Factor IV represents coarse to medium silt that has been segregated from areas of relatively high energy. Factor V represents both the production of sediments finer than medium silt and deposition within the lowest-energy environment in this area. Modern and palimpsest sediments are areally prevalent over this section of the shelf. Relict sediments occur in only a few small areas. The dispersal of sediments is affected by surface and tidal currents as well as wave action. Ice rafting is not an important geological agent. Sediments on subarctic continental shelves are not necessarily characterized by an abundance of rocky sediments or gravel. (Knapp-USGS)
W73-15267

STORM-GENERATED CURRENT IN LA JOLLA SUBMARINE CANYON, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02E.
W73-15268

DEEP-SEA ZEOLITES: VARIATIONS IN SPACE AND TIME IN THE SEDIMENTS OF THE INDIAN OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. Venkatarathnam, and P. E. Biscaye.
Marine Geology, Vol 15, No 1, p M11-M17, August 1973. 1 fig, 9 ref.

Descriptors: *Zeolites, *Bottom sediments, *Indian Ocean, Silicates, Mineralogy, Weathering, Diagenesis, Volcanoes, Stratigraphy, Provenance, Clay minerals.

In the Indian Ocean, the zeolite phillipsite is often found in Miocene and younger sediments and is confined to the central areas of the sea floor. This zeolite forms from the alteration of basic volcanic material and does not require much time for its formation. Another zeolite, clinoptilolite, however, is most often restricted to Cretaceous to Eocene sediments in areas closer to the continental land masses. This distribution in space and time is thought to be due to the availability of silicic volcanics during the early formation of the Indian Ocean in the Cretaceous to Eocene time. The mobilization of silica from opal-rich sediments during these times may also have been an important factor in the formation of clinoptilolite. (Knapp-USGS)
W73-15269

NO CURRENT REVERSAL AT 10,000 B.P. IN THE STRAIT OF GIBRALTAR,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 02E.
W73-15273

INTRODUCED ANIMAL EFFECTS AND EROSION PHENOMENA IN THE NORTHERN UREWERA FORESTS,
Olsen (P. F.) Co. Ltd., Rotorua (New Zealand).
For primary bibliographic entry see Field 04D.
W73-15291

OCCURRENCE OF MICROORGANISMS OF DECOMPOSING ORGANIC PHOSPHORUS COMPOUNDS IN 2 TYPES OF BOTTOM SEDIMENTS OF THE EUTROPHIC LAKE JEZIORAK,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
For primary bibliographic entry see Field 05C.
W73-15293

2K. Chemical Processes

EFFECTS OF DEVELOPMENT ON SALINITY AND LIMNOLOGY OF THE LOWER COLORADO RIVER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 05C.
W73-14756

THE IZAA SPRECTROMETER: A DETECTOR FOR TRACE ELEMENTS IN GASES, LIQUIDS, AND SOILS,
California Univ., Berkeley. Lawrence Berkeley Lab.
B. D. Zak, R. D. McLaughlin, D. A. Church, and T. Hadeishi.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 10, p 52-57, 1973. 1 fig, 1 tab.

Descriptors: *Spectrophotometry, *Trace elements, *Chemical analysis, Photometry, Analytical techniques.
Identifiers: *Isotope-Zeeman atomic absorption photometry.

In order that an adequate program of monitoring of trace elements be feasible, instrumentation must be sensitive, accurate, portable, and relatively inexpensive. The isotope-Zeeman atomic absorption (IZAA) technique provides such instrumentation. In the IZAA technique, a solid, liquid, or gaseous sample is thermally decomposed in a furnace maintained at an appropriate temperature. The decomposition products are then swept into a heated atomic absorption tube by a stream of carrier gas. Here they are probed with a light beam which has two constituents; one constituent has a wavelength centered on the absorption profile of the trace element being measured, while the other is slightly displaced. By taking the difference between the absorption of the two constituents, the absorption due to the trace element alone may be measured. This background cancellation results in strong discrimination against interferences. (Knapp-USGS)
W73-14785

DETERMINATION OF TRACE QUANTITIES OF ARSENIC IN WASTEWATERS BY CARBON ROD ATOMIC ABSORPTION SPECTROMETRY,
Los Angeles County Sanitation District, Whittier, Calif. San Jose Creek Water Quality Lab.
For primary bibliographic entry see Field 05A.
W73-14786

APPLIED WATER CHEMISTRY AT WASHINGTON STATE UNIVERSITY,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 09A.
W73-14787

SOME REACTIONS OF CHLORINE AND OXY--CHLORINE SPECIES WITH ORGANIC COMPOUNDS IN AQUEOUS MEDIA,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md
For primary bibliographic entry see Field 05B.
W73-14799

THE CHEMISTRY OF AQUEOUS NITROGEN TRICHLORIDE,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics
For primary bibliographic entry see Field 05B.
W73-14800

KINETICS OF TRIBROMAMINE DECOMPOSITION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05F.
W73-14801

DECHLORINATION BY ACTIVATED CARBON,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-14803

SIMILARITIES BETWEEN MN, NI AND CO CONTENTS OF DEEP-SEA CLAYS AND MANGANESE NODULES FROM THE SOUTH-WEST REGION OF THE NORTH ATLANTIC,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W73-14816

OXYGEN UPTAKE OF BOTTOM SEDIMENTS STUDIED IN SITU AND IN THE LABORATORY,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 05B.
W73-14822

WATER QUALITY AND MINERAL SOLUBILITIES IN SURFACE AND GROUND WATER; OAK OPENINGS COMMUNITY, LUCAS CO., OHIO,
Toledo Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 04B.
W73-14863

RAMAN SPECTRA AND STRUCTURE OF WATER IN DIMETHYL SULFOXIDE,
Western Regional Research Lab., Berkeley, Calif.
For primary bibliographic entry see Field 01B.
W73-14939

SPECTROPHOTOMETRIC DETERMINATION OF VANADIUM IN SEA WATER,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 05A.
W73-14950

A NEUTRON ACTIVATION PROCEDURE FOR THE DETERMINATION OF DISSOLVED SILVER IN SEA WATER,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W73-14951

ANALYSIS OF HIGH-PURITY WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. I. THE USE OF AN AUTOMATED SAMPLING SYSTEM,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.

For primary bibliographic entry see Field 05A.
W73-14955

ANALYSIS OF HIGH-PURITY WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. II. SIGNAL INTEGRATION WITH A NON-RESONANCE LINE CORRECTION SYSTEM FOR SPURIOUS ABSORPTION PHENOMENA,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 05A.
W73-14956

TWENTY-FIFTH HYDROCHEMISTRY CONFERENCE (XXV GIDROKHIMICHESKOYE SOVESHCHANIYE),
For primary bibliographic entry see Field 02A.
W73-15016

ION SELECTIVE FLOW-THROUGH ELECTRODES: CONSTRUCTION AND PROPERTIES OF HEAVY METAL SENSORS,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-15170

EQUILIBRIUM CONCEPTS IN NATURAL WATER SYSTEMS.
American Chemical Society, Washington, D.C.

Advances in Chemistry Series 67, 1967. 344 p.

Descriptors: *Water chemistry, Water balance, Equilibrium, Aqueous solutions, *Thermodynamic behavior, Equations, *Mathematic studies, Metals, *Water analysis, Sediments, Clays, Oxides, Silica carbonates, Springs, Lakes, Great Lakes, Oceans, Oxidation-Reduction potential, *Geochemistry, Biology, Model studies.
Identifiers: Hydroxides, Carbonate hydroxides, *Equilibrium models, Gibbs phase Rule, *Water solute interactions.

Natural waters are complex systems whose chemistry cannot be described without considering many variables. To overcome this complexity, simplified, manageable models are used to help researchers understand and predict real systems. As of now, the theory of thermodynamic equilibrium appears to be the most expedient concept for the identification of many variables relevant to the identification of the mineral relationships and the establishment of chemical boundaries of aquatic environments. As the state of equilibrium in the open, dynamic system represented by natural waters is an abstraction, a useful model need not be realistic as long as it provides a valuable research tool to help determine the factors that control the chemistry of natural systems. A concept of equilibrium associated with one or more of the many variables that affect total system equilibrium is discussed in each of the 16 chapters. (Smith-NWWA)
W73-15190

CALCULATION OF WATER QUALITY FROM ELECTRICAL LOGS THEORY AND PRACTICE,
Geological Survey, Baton Rouge, La.
A. N. Turcan, Jr.
Louisiana Department of Conservation and Geological Survey, Louisiana Department of Public Works, Baton Rouge. Water Resources Pamphlet No 19, 1966. 23 p, 7 fig, 2 tab, 21 ref.

Descriptors: *Resistivity, *Analytical methods, Water chemistry, Aquifer characteristics, *Conductivity, *Water quality, Electrical well logging, Wells.
Identifiers: *Specific conductance, Interstitual water, *Dissolved solids content.

Data from electrical logs are used by the hydrologist for geologic correlation purposes and for quantitative and qualitative determination of some of the chemical constituents of water in a formation. An empirical method is presented of quantitatively determining the resistivity of the water in unconsolidated formations in the Gulf Coast area from resistivity readings on electrical logs. An estimate of the concentration of some ions in water in an aquifer can be made from electrical logging data if an empirical ratio between the resistivity reading of the electrical log and the resistivity of the formational water has been established. The theory and field applicability of this analytical method are presented. (Campbell-NWWA)
W73-15193

PRECIPITATION AND LITHIFICATION OF MAGNESIAN CALCITE IN THE DEEP-SEA SEDIMENTS OF THE EASTERN MEDITERRANEAN SEA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W73-15265

HYDROLOGIC DATA FOR 1971, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-15266

2L. Estuaries

NEW FLUORESCENT TRACER DETECTION TECHNIQUES FOR USE IN POLLUTED ENVIRONMENTS,
Rhode Island Univ., Kingston. Dept. of Physics.
For primary bibliographic entry see Field 05B.
W73-14770

SALT-WATER MOVEMENT IN THE LOWER WITHLACOOCHEE RIVER--CROSS-FLORIDA BARGE CANAL COMPLEX,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 08B.
W73-14808

SUSPENDED SEDIMENT TRANSPORT FROM THE GIRONDE ESTUARY (FRANCE) ONTO THE ADJACENT CONTINENTAL SHELF,
Institut de Geologie du Bassin d'Aquitaine, Talence (France).
G. P. Allen, and P. Castaing.
Marine Geology, Vol 14, No 5, p M47-M53, June 1973. 3 fig, 1 tab, 13 ref.

Descriptors: *Sediment transport, *Estuaries, *Continental shelf, Currents (Water), Streamflow, Sedimentation, Turbidity, Suspended load, Silts, Clays, Measurement.
Identifiers: *France (Gironde Estuary).

Current velocity and suspended concentration measurements in the downstream extremity of the Gironde Estuary indicate that during periods of high river discharge, a significant amount of suspended sediment is transported out of the estuary onto the adjacent continental shelf. The vertical profile of the nontidal suspended sediment flux is similar to that of the current velocity, with a net upstream flux near the bottom and an overlying seaward-directed transport. The overall, depth-integrated result is a net seaward transport of suspended sediment out of the estuary. This net seaward transport varies directly with tidal amplitude. Aerial photography and water sampling indicate that during high river inflow, the downstream extremity of the turbidity maximum extends onto the continental shelf at ebb tide. The tidal and coastal current patterns of the inlet and inner shelf induce a northward transport of the turbid estuarine water, and at each tidal cycle, a certain amount of suspended sediment leaves the estuary; part of this sediment is deposited in a silt and clay zone on the continental shelf. (Knapp-USGS)
W73-14813

A CHENIER SEQUENCE AT BROAD SOUND, QUEENSLAND, AND EVIDENCE AGAINST A HOLOCENE HIGH SEA LEVEL,
Bureau of Mineral Resources, Geology and Geophsics, Canberra (Australia).
P. J. Cook, and H. A. Polach.
Marine Geology, Vol 14, No 4, p 253-268, May 1973. 10 fig, 1 tab, 33 ref.

Descriptors: *Beaches, *Deltas, *Sedimentation, *Sea level, Australia, Pleistocene epoch, Erosion, Aggradation, Stratigraphy, Geomorphology, Coasts, Recent epoch.
Identifiers: *Cheniers, *Australia (Broad Sound).

A prograding chenier plain on the west side of Broad Sound, Australia, is up to 5-km wide and individual beach ridges (cheniers) are up to 5-km long. The cheniers formed during periods of low sediment supply, leading to the erosion of mangrove deposits and the development of a beach ridge. Radiocarbon dating revealed that cheniers formed at about 5000, 4500, 3550, 2500, 1600 and 700 years B.P. There is no significant change in the elevation of the cheniers during this 500 year interval. Sea level stabilized at about the present level approximately 5000 years B.P. Since that time mean sea level has varied by no more than 1 m. (Knapp-USGS)
W73-14815

SUSPENDED MATTER IN SURFACE WATERS OF THE EASTERN GULF OF GUINEA,
Woods Hole Oceanographic Institution, Mass.
B. D. Bornhold, J. R. Mascle, and K. Harada.
Marine Geology, Vol 14, No 4, p M21-31, May 1973. 6 fig, 2 plate, 11 ref.

Descriptors: *Suspended load, *Atlantic Ocean, *Ocean currents, Provenance, Sediment transport, Sedimentation, Organic matter, Deltas, *Africa.
Identifiers: *Gulf of Guinea.

Suspended matter in the surface waters of the eastern Gulf of Guinea was studied in relation to the prevailing oceanic currents and the sediment composition and source. A confused current system arises from the confluence of the Guinea Current and the South Equatorial Current in this area. Sediment-laden water is transported to the south of Fernando Poo into the Gulf in a southwesterly direction. The southeasterly flowing Guinea Current along the western edge of the Niger delta and the enormous sediment loads of the distributaries in this area contribute to a major lobe of suspended matter off the southwestern nose of the delta. Sediment concentration is inversely related to salinity in the northeastern Gulf. Sediment is also swept northwestward from the continental shelf of Gabon and the Congo Republic into the Gulf. Diatoms are the most abundant constituents with lesser amounts of organic aggregates and two varieties of fecal pellets. (Knapp-USGS)
W73-14817

HISTORY AND SAND BUDGETS OF THE BARRIER ISLAND SYSTEM IN THE PANAMA CITY, FLORIDA, REGION,
Florida State Univ., Tallahassee. Dept. of Geology.
F. Stapor.
Marine Geology, Vol 14, No 4, p 277-286, May 1973. 5 fig, 9 ref.

Descriptors: *Beaches, *Beach erosion, *Sedimentation, *Barrier islands, *Florida, Sediment

transport, Sedimentation rates, Sand spits, Geomorphology, Coasts, Sand bars.
Identifiers: Panama City (Fla), *St. Andrew Sound (Fla).

Shell Island and Crooked Island peninsulas form the Holocene barrier system in the Panama City, Florida, region. Both of these peninsulas have experienced a history of alternating integration and fragmentation superimposed on a net shoreward migration since 1779. Catastrophic events such as hurricanes are responsible for the pass cutting which has fragmented these barriers. Both barrier peninsulas have very nearly segmented St. Andrew Sound into an eastern and western portion. This segmentation has been achieved through natural causes in the eastern or Crooked Island region, but an alternation in the tidal return pattern, effected by the cutting of a canal across Shell Island, is probably responsible for the ongoing segmentation of the western portion. Rates of erosion and deposition, determined by comparing bathymetries charted in 1877, 1930, and 1946, show that these two peninsulas receive material by eastward transport. The longshore drift of both peninsulas is bidirectional, northwesterly and southeasterly. These two drift components are very nearly equal in magnitude immediately west of Shell Island; net easterly drift occurs on Shell Island peninsula. Crooked Island experiences net westerly and easterly drift; the easterly drift terminates in the Bell Shoal area and does not reach the adjacent St. Joe Spit. (Knapp-USGS)
W73-14818

SHALLOW WATER HYDROIDS OF THE DELAWARE BAY REGION,
Delaware Univ., Lewes. Coll. of Marine Studies.
L. Watling, and D. Maurer.
J Nat Hist. Vol 6, No 6, p 643-649. 1972, Illus.
Identifiers: Bay, Crabs, *Delaware Bay, Hermit, *Hydroids, Oysters, Salinity, Snails,.

Eighteen species of hydroids were identified in Delaware waters. The diversity of this fauna is low with respect to Calder's (1971) studies in Chesapeake Bay (43 spp.). All the species in this study but Eulaomedea angulata occur in Chesapeake Bay. Obelia bicuspidata, O. longicyatha, Garveia franciscana, Tubularia crocea, Hartlaubella gelatinosa, Sertularia argentea and Hydractinia echinata were among the principal local species. Hartlaubella gelatinosa and S. argentea were commonly collected from oyster shells and O. bicuspidata was frequently taken from G. franciscana. Hydractinia echinata was never collected from oyster shells, but was characteristically found on the shells of the moon snail Polinices duplicatus (Say) and mud snail Nassarius obsoletus (Say) inhabited by hermit crabs. Sertularia argentea and in particular Tubularia crocea appear to be important local winter species. A larger number of species occur in the oyster producing tributaries and natural and planted oyster beds of Delaware Bay than in Rehoboth and Indian River Bays. Although the planted beds may be an exception, this may be attributable to less intensive collecting from such areas. Oyster beds contain the largest areas of hard substrate in Delaware waters. The smaller bays consist of soft mud-sand bottoms with intermittent growths of algae and scattered deposits of shell fragments. Salinity is normally higher in Rehoboth (22-28%) and Indian River (20-33%) Bays than in the Leipsic River (12-20%) and over the natural oyster beds (18-22%). In polyhaline salinities the distribution of local hydroids is associated more with a hard substrate than with salinity.--Copyright 1973, Biological Abstracts, Inc.
W73-14819

MINIMUM LENGTH OF SALT INTRUSION IN ESTUARIES,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
B. P. Rigter.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 10010, p 1475-1496, September 1973. 14 fig, 8 tab, 4 ref, append.

Descriptors: *Saline water intrusion, *Estuaries, *Density currents, Stratified flow, Saline water-freshwater interfaces, Tidal waters, Tides, Salinity, Model studies, Hydraulic models, Flumes.

Salt intrusion from a sea basin into estuaries was studied in a rectangular flume. Boundary conditions in the experiments include seawater density, tidal amplitude, and hydraulic resistance. Minimum and maximum lengths of salt intrusion during a tidal cycle are given as functions of the varied quantities. Dimensional analysis was applied to find correlations between the minimum length of salt intrusion and tidal quantities. Results give the relation between a nondimensional parameter containing the minimum length of salt intrusion, the depth and resistance coefficient, and three nondimensional parameters characterizing the tidal movement and containing the density difference between seawater and freshwater. (Knapp-USGS)
W73-14842

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME I, SUMMARY REPORT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05C.
W73-14876

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WASTERS, VOLUME II, A STATISTICAL EVALUATION OF THE RELATIONSHIP BETWEEN TOXICITY AND SPECIES DIVERSITY INDEX.
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 05C.
W73-14877

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME III, ACUTE TOXICITY OF DISCHARGED WASTES,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 05C.
W73-14878

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME VI, BIOASSAYS OF LOWER TROPHIC LEVELS,
California Univ., Berkeley. Sanitary Engineering Research Lab.; and California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 05C.
W73-14879

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME VII, EFFECTS OF SELECTED WASTE DISCHARGES ON BENTHIC INVERTEBRATE COMMUNITIES,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 05C.
W73-14880

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME VIII, ALGAL ASSAYS OF SELECTED WASTE DISCHARGES,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05C.
W73-14881

A NUMERICAL MODEL OF ESTUARINE POLLUTANT TRANSPORT,
California Univ., Berkeley Dept of Civil Engineering
For primary bibliographic entry see Field 05B
W73-14900

THE ECOLOGY OF THE SOUTHERN CALIFORNIA BIGHT: IMPLICATIONS FOR WATER QUALITY MANAGEMENT.
Southern California Coastal Water Research Project, El Segundo
For primary bibliographic entry see Field 05C.
W73-14914

SOME FACETS OF THE IMPACT OF PULP MILL EFFLUENT ON THE ALBERNI INLET,
Fisheries Research Board of Canada, Nanaimo (British Columbia).
For primary bibliographic entry see Field 05B.
W73-14932

MERCURY CONCENTRATIONS IN DATED VARVED MARINE SEDIMENTS COLLECTED OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 05B.
W73-14937

ECOLOGICAL IMPLICATIONS OF FALLOUT RADIOACTIVITY ACCUMULATED BY ESTUARINE FISHES AND MOLLUSKS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05B.
W73-14961

INVESTIGATION OF THE WATER TABLE IN A TIDAL BEACH, FINAL REPORT.
Virginia Inst. of Marine Sciences, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14985

APPRAISAL OF THE WATER RESOURCES OF CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-14996

WATER RESOURCES OF THE DELMARVA PENINSULA, A SUMMARY REPORT TO THE CONGRESS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W73-15000

REMOTE MEASUREMENT OF SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
G. C. Thomann.
Remote Sensing of Environment, Vol 2, No 4, p 249-259, 1973. 8 fig, 4 tab, 21 ref.

Descriptors: *Remote sensing, *Salinity, Estuaries, Sea water, Data collections, Hydrologic data, Microwaves, *Mississippi, *Louisiana, Instrumentation, Calibrations.

The microwave emission of seawater is dependent upon salinity in the low microwave spectrum. It is possible to measure remotely the surface salinity using the 21 cm wavelength with an accuracy of one part per thousand in a salinity range of 5 to 35 parts per thousand. The dielectric constant of seawater can be represented by that of NaCl. The effects of the atmosphere, cosmic noise, sea surface roughness, and constant radiometer errors can be

corrected using surface calibration measurements. Experiments were performed in Mississippi and Louisiana coastal waters. (Knapp-USGS)
W73-15001

SUSPENDED SEDIMENT OBSERVATIONS FROM ERTS-1,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, J. F. Borchardt, and W. M. Treasure.
Remote Sensing of Environment, Vol 2, No 4, p 205-221, 1973. 11 fig, 14 ref. ONR-GP N00014-69-A0407 NASA-ERTS-1 NAS5-21837.

Descriptors: *Remote sensing, *Satellites (Artificial), *Turbidity, *Suspended load, Oceanography, Water circulation, Estuaries, Delaware River, Tides, Data collections, Hydrologic data.
Identifiers: *ERTS, *Delaware Bay.

Satellite imagery from four ERTS-1 passes over Delaware Bay during different portions of the tidal cycle shows suspended sediment, which is a natural tracer for circulation patterns. The MSS red band (band 5) gives the best contrast. Color density slicing improves the differentiation of turbidity levels. However, color additive enhancements are of limited value since most of the information is in a single color band. The ability of ERTS-1 to present a synoptic view of the surface circulation over the entire bay is shown to be a valuable and unique contribution of ERTS-1 to coastal oceanography. (Knapp-USGS)
W73-15002

DISTRIBUTION, TRANSPORT, AND COMPOSITION OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
B. F. d'Anglejan, and E. C. Smith.
Canadian Journal of Earth Sciences, Vol 10, No 9, p 1380-1396, September 1973. 13 fig, 3 tab, 34 ref.

Descriptors: *Suspended load, *Estuaries, *St. Lawrence River, Canada, Tides, Sediment yield, Turbidity, Suspended solids, Particle size.

The distribution of total suspended matter in the estuary of the St. Lawrence River was studied by quantitative filtration through membrane filters. Tidal fluctuations in the vertical gradients of suspended load were followed at fixed stations along the estuary. The concentrations varied from nearly 40 mg/liter below Ile d'Orleans, to values less than 1 mg/liter at the downstream end of the upper estuary near the Saquenay River entrance. The tidal mean concentrations for the fixed stations ranged from 20 mg/liter to 2 mg/liter. A turbidity maximum, which develops because of entrapments of particles by the tidal circulation, extends for 100 km below Quebec City. In this zone large vertical gradients changing in intensity with the tide by resuspension of settled material exist above the bottom. The total suspended matter is 60% to more than 90% inorganic by weight, and has a mean particle size between 5 and 7 micrometers. The annual rate of transport of suspended material out of the upper estuary at a section near the Saquenay River is estimated at less than 1 million metric tons. Chemical and mineralogical analyses were performed on 23 suspensoid samples collected by centrifuging large volumes of water. The clay mineral composition of the less than 2 micrometer fraction is on the average 1.5% montmorillonite, 8% kaolinite, 31% chlorite, and 60% illite. However, large time and space variations are found both in the chemistry and mineralogy of the suspended matter. (Knapp-USGS)
W73-15004

UNRELIABILITY OF THE C-14 METHOD FOR ESTIMATING PRIMARY PRODUCTIVITY IN EUTROPHIC DUTCH COASTAL WATERS,
Netherlands Inst. for Sea Research, Den Helder.
For primary bibliographic entry see Field 05A.
W73-15078

PHYTOPLANKTON ORGANIZATION IN BAIE DES CHALEURS (GULF OF ST LAWRENCE),
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
L. Legendre.
The Journal of Ecology, Vol 61, No 1, p 135-149, March 1973. 5 fig, 4 tab, 27 ref.

Descriptors: *Phytoplankton, *Biological communities, *Canada, Environmental effects, Stability, Statistical methods, Pyrrophyta, Chrysophyta, Chlorophyta, Plant populations, Dominant organisms, Ecological distribution, Probability, Methodology, Nutrients, Water temperature, Marine algae, Upwelling, Nitrates, Water sampling, Gymnodinium, Marine microorganisms, Dinoflagellates, Diatoms.
Identifiers: *Gulf of St. Lawrence, *Species diversity, *Data interpretation, Species diversity index, Seasonal variation, Probabilistic similarity index, Marine environment, Silicon, Chilomonas, Nitzschia closterium, Peridinium, Pyramimonas, Strombidium, Chaetoceros debilis, Chaetoceros diadema, Chaetoceros laciniosus, Thalassiosira, Nitzschia seriata, Leptocylindrus danicus, Dinobryon, Vertical distribution, Analysis of variance.

Community structure of phytoplankton in Baie des Chaleurs (Gulf of St Lawrence) was investigated by means of an entirely probabilistic procedure; such an approach gives support to the existence of phytoplankton associations, stable over periods of many weeks, that are under the control of such environmental factors as nutrients and temperature. The procedure used for association identification is explained, and its advantages as well as inconveniences are stressed in comparison with more usual techniques. Species diversity is analyzed in relation to the upwelling conditions of the bay, and conclusions are made within the general framework of a prediction of species diversity from biological activity and environmental stability. Consideration of these two factors stresses the significance of time scales involved and suggests that species diversity is the modulation along a time axis of species evenness by species richness. (Holoman-Battelle)
W73-15111

MORPHOLOGY AND DEVELOPMENT OF A NEW ALGA, HALOPLEGMA ANWERII (CERAMIACEAE) FROM KARACHI COAST,
Karachi Univ. (Pakistan). Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-15133

COASTAL ZONE MANAGEMENT ACT: A BROADER SCOPE FOR STATE INITIATIVE,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 06E.
W73-15142

THE FEDERAL COASTAL ZONE MANAGEMENT ACT OF 1972,
Louisiana State Univ., Baton Rouge. Office of Sea Grant Development.
For primary bibliographic entry see Field 06E.
W73-15148

A BILL TO AUTHORIZE THE ESTABLISHMENT OF THE FLORIDA FRONTIER HISTORIC RIVERWAY.
For primary bibliographic entry see Field 06E.
W73-15151

TAKING VERSUS REASONABLE REGULATION: A REAPPRAISAL IN LIGHT OF REGIONAL PLANNING AND WETLANDS,
For primary bibliographic entry see Field 06E.
W73-15156

SYNOPTIC MEASUREMENTS OF CURRENTS AND SEDIMENT TRANSPORT ON THE CONTINENTAL SHELF, (ANNUAL PROGRESS REPORT),
Washington Univ., Seattle.
For primary bibliographic entry see Field 05B.
W73-15242

RADIOCESIUM DISTRIBUTION IN WATER, SEDIMENT, AND BIOTA IN THE HUDSON RIVER ESTUARY FROM 1964 THROUGH 1970,
New York Univ. Medical Center, N.Y.
For primary bibliographic entry see Field 05B.
W73-15247

ON THE ORIGIN OF THE WHITING (MERLANGIUS MERLANGUS (L.) IN KIEL BAY, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
W. Arntz, and W. Weber.
Ber Dtsch Wiss Komm Meeresforsch. Vol 22, No 3, p 385-397, 1972, Illus, (English summary).
Identifiers: Bays, *Germany (Kiel Bay), Merlangius-Merlangus, *Parasites, Stocks, *Whiting Spawning, Ectoparasites.

The frequency of appearance of the whiting (M. merlangus (L.)) in Kiel Bay, the size composition of the stock, the spawning conditions, the occurrence of eggs and larvae, and infestation by ectoparasites are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-15278

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PROSPECTS OF INCREASING FRESHWATER RESOURCES IN THE USSR THROUGH DESALTING OF SALINE AND BRACKISH WATERS (PERSPEKTIVY UVELICHENIYA RESURSOV PRESNYKH VOD NA TERRITORII SSSR ZA SCHET OPRESNENIYA SOLENYKH I SOLONOVATYKH VOD),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Moscow (USSR).
V. A. Klyachko.
Vodnyye Resursy, No 1, p 173-180, 1972. 5 fig, 1 tab, 6 ref.

Descriptors: Freshwater, *Saline water, *Brackish water, Desalination, *Desalination processes, Distillation, Electrodialysis, Reverse osmosis, Freezing, Solvent extractions, Ion exchange, Crystallization, Desalination apparatus, Desalination plants, Cost-benefit analysis, Forecasting, *Cost analysis.
Identifiers: *USSR.

Desalting processes which show promise in the next 15-20 years are distillation, electrodialysis, reverse osmosis, and freezing. Less suitable processes include crystallization of water in the form of crystalline hydrates of hydrocarbon gases, extraction of water by organic solvents, and removal of salts through use of ion exchangers. Distillation using heat will be employed in southern regions of the USSR to desalt small quantities of saline water containing more than 15

g of salt/liter. Subsurface brackish and weakly saline waters containing 3-12 g of salt/liter will soon be converted to freshwater by electrodialysis and reverse osmosis. The USSR is constructing portable electrodialysis units with a capacity of 20 cu m/day (for desalting water containing 5 g of salt/liter) as well as stationary units with capacities of 12, 25, 50, 120, and 350 cu m/day. About 100 electrodialysis units of varying capacity are currently in operation in the country. Use of desalinized water will be determined by the ratio of the cost of delivering water from the nearest freshwater source to consumer to the cost of on-site desalination. The cost of delivering 1 cu m of water from a freshwater source increases with increasing distance to the place of use and with decreasing daily water consumption. Within the near future the capacity of saline-wastewater conversion installations will reach 1 billion cu m/year. (Josefson-USGS)
W73-14854

ANOTHER RIO GRANDE FOR NEW MEXICO,
Los Alamos Scientific Lab., N. Mex.
L. P. Reinig, R. I. Brasier, B. J. Donham, and W. S. Gregory.
Available from NTIS, Springfield, Va., as CONF-730438-1; $4.00 in paper copy, $1.45 in microfiche. Report CONF-730438-1, April 1973. 12 p, 3 fig, 1 tab, 9 ref.

Descriptors: *Desalination, *New Mexico, *Aquifers, *Feasibility studies, Cost-benefit analysis, Nuclear powerplants, Geothermal studies, Pilot plants, Desalination plants, Saline water.
Identifiers: *Tularosa Valley (N. Mex).

To desalt the several hundred million acre-feet of saline ground water in the Tularosa Valley (New Mexico) at a rate of several million tons per year, a 15-year plan is suggested (the Tularosa-Rio Grande Project). Contingent upon feasibility studies of the use of nuclear or geothermal power in various areas of concern (political and legal, sociological, economic, environmental, and technical), demonstration plants of 1-, 10-, and 1000-million gallons per day would be followed by a 1-billion-gallon-per-day plant that would also generate 2000 mega-watts of electric power. (Bopp-ORNL)
W73-15232

3B. Water Yield Improvement

MODELING AND SIMULATION OF RESERVOIRS TO PREDICT EVAPORATION REDUCTION BY SURFACE FILMS,
Arizona State Univ., Tempe. Dept. of Chemical Engineering.
C. O. Reiser, and J. L. Adams.
Available from the National Technical Information Service as PB-224 138, $3.00 in paper copy, $1.45 in microfiche. Completion Report, September 1973. 34 p, 13 fig, 14 ref, append. OWRR A-041-ARIZ (1). 14-31-0001-3803.

Descriptors: *Evaporation control, *Monomolecular films, Model studies, Simulation analysis, *Computer models, Alcohols, Antitranspirants, *Reservoir evaporation, *Arizona.
Identifiers: *Evaporation modeling, *Lake Hefner (Ariz).

A computer model based upon an energy budget has been constructed to simulate water evaporation from reservoirs and the effect of adding an antievaporant film. In order to produce a workable model for these initial calculations, simplifying assumptions were made considering heat and mass interchange only at the surface with no lateral flow. Subcooling of the surface is considered to induce vertical mixing of the warmer section below to produce an istothermal epilmnion. The results obtained give a fair match with data measured for Lake Hefner, but give lower temperatures for the hypolimnion and a final yearly temperature slightly lower than the starting temperature. Neglect of circulation effects in the model and the use of average meteorological data may account for these discrepancies. Temperature profiles and evaporation savings have been computed for the application of a film with a specific resistance of three sec./cm. A ten-month continuous film coverage predicts an annual evaporation reduction of 46% but this drops to 27% if the film application is restricted to daytime hours of 9 a.m. to 9 p.m. With an eight-month treatment starting in May, evaporation savings drop to 38% but the same maximum July surface temperature which is 5C. higher than an untreated surface is attained. The winter isothermal reservoir temperature is increased 1C. by a 10-month film cover.
W73-14868

WEATHER MODIFICATION ACTIVITIES IN TEXAS, 1970-72.
Texas Water Development Board, Austin.

Report 175, August 1973. 34 p, 1 tab.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, Droughts, Rainfall, Meteorology, Water shortage, Irrigation, Water yield improvement.

Since September 1, 1967, all legally performed weather modification activities in Texas have been carried out under the scope and authority of the Texas Water Development Board through the Texas Weather Modification Act (Chapter 14, Texas Water Code). The Act provides for the regulation and proper documentation of all weather modification projects taking place within the State. The weather modification licenses and project permits which have been issued through 1972 are tabulated, and the weather modification activities which took place are described. No attempt is made to analyze the degree of success of these activities. (Woodard-USGS)
W73-14998

THE ROLE OF WEATHER MODIFICATION IN DROUGHT RELIEF,
Bureau of Reclamation, Denver, Colo. Div. of Atmospheric Water Resources Management.
W. E. Howell, and L. O. Grant.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 551-560, 1973. 1 tab, 8 ref.

Descriptors: *Weather modification, *Droughts, *Cloud seeding, Water shortage, Water yield, Meteorology.

Drought mitigation is the focus of some of the largest and most conspicuous efforts in the application of weather modification. Important technical advances during the past 10 years make possible an improved appraisal of the role of weather modification in drought relief. Clouds that exist during drought intervals frequently have characteristics that fall within the 'window' area for which seeding is required for an efficient utilization of cloud water. In arid and semiarid areas the role of weather modification is the augmentation of overall water supplies on a continuing basis. In less arid regions, weather modification should, at least during some droughts, make the difference between catastrophe and the maintenance of a stable economy. (Knapp-USGS)
W73-15069

3C. Use of Water of Impaired Quality

DISPOSAL OF SUGAR REFINERY LAGOON EFFLUENTS BY SOIL SPREADING,
North Dakota State Univ., Fargo. Dept. of Bacteriology
For primary bibliographic entry see Field 05D
W73-14755

MUSKEGON SPRAYS SEWAGE EFFLUENTS ON LAND,
Environmental Protection Agency, Chicago, Ill. Region V
For primary bibliographic entry see Field 05D
W73-14884

SALT TOLERANCE AND CATION INTERACTION IN ALKALI SACATON AT GERMINATION,
Sind Univ., Hyderabad (Pakistan). Dept. of Botany.
S. Z. Hyder, and S. Yasmin.
Journal of Range Management, Vol 25, No 5, p 390-392, September 197. 6 fig, 9 ref

Descriptors: *Forage grasses, *Salt tolerance, *Cations, *Germination, *Plant physiology, Semiarid climate, Water supply, Plant growth, Seeds, Osmotic pressure, Magnesium, Sodium chloride, Calcium, Salts.
Identifiers: *Pakistan.

Alkali sacaton (Sporobolus airoides Torr.) is an important forage plant of Southwest U.S. that can grow under natural rainfall, where land is highly saline and adequate water for leaching the salt is not available; therefore, it was chosen for study for salt tolerance and cation interaction for use in semiarid areas of West Pakistan. Results showed that germination was inhibited at a concentration of 275 meq/liter of sodium chloride. Mannitol and other salts at iso-osmotic pressure restricted germination in the following decreasing order: MgCl 2, KCL, CaCl 2, NaCl, and mannitol. Calcium and sodium partially counteracted the inhibitory effects of magnesium on germination. Greater recovery in germination was noted by addition of calcium than sodium in seeds previously treated with a high concentration of magnesium chloride. The role of sodium and calcium in counteracting magnesium effects is discussed, with concluding statements concerning the specific effects of salts which are more important than osmotic effects on seed germination of this species. (Bahre-Ariz.)
W73-15215

SALINITY, PLANT GROWTH, AND METABOLISM,
Western Australia Univ., Nedlands. Dept. of Agronomy.
H. Greenway.
Journal of the Australian Institute of Agricultural Science, Vol 39, No 1, p 24-34, March 1973. 6 fig, 3 diag, 3 tab, 61 ref.

Descriptors: *Salinity, *Plant growth, *Metabolism, Water utilization, Agriculture, Arid climates, Semiarid climates, Saline water, Plant physiology, Plant breeding, Electrolytes, Water shortage, Irrigation, Salt tolerance.

Water use for agricultural purposes, in arid and semiarid climates, usually implies the use of saline water. The challenge, then, is to increase the physiological tolerance of plants to saline water. Steps to improve agriculture in saline areas include: assessing large numbers of plant species for their response to salt; plant breeding for salt tolerance before further selection for other characteristics; and the understanding of causes for varietal differences in salt tolerance which

would provide the basis for methods of selection at very early growth stages. Species should be evaluated in terms of causes for growth stimulations and growth reductions with the organism as a whole considered. Understanding how electrolytes and water deficits affect metabolism, along with information on growth and development should be the basis for further study in situations where either specific ion effects or water deficits are indications of salt injury. Physiological research should aim at the elucidation of the mechanisms of salt tolerance of various species especially if irrigation agriculture continues on a world wide scale. This research would further aid in understanding other biological issues, such as the physiology of marine organisms. (Bahre-Ariz.)
W73-15218

3D. Conservation in Domestic and Municipal Use

MATHEMATICAL MODELING OF URBAN WATER MANAGEMENT STRATEGIES,
Colorada State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 06B.
W73-14757

TESTING OF METHODS FOR DETERMINATION OF URBAN RUNOFF,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-14835

LEGAL CONSTRAINTS ON URBAN WATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg.
Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 99, No UP2, Proceedings paper No 9986, p 137-145, September 1973. 1 fig, 24 ref.

Descriptors: *Water management (Applied), *Systems analysis, Constraints, Legal aspects, Decision making, Water rights, Legislation, *Institutional constraints, *Colorado.
Identifiers: *Urban development, *Denver (Colo).

Both strategic and tactical level decisions regarding urban water management are subject to legal constraints. In a systems study it is desirable to find ways to better a water system such that the level of performance of the system is improved. Legal constraints which inhibit such improvement are classified and their effect on a typical regional water system, e.g., Denver, Colorado is noted. It is shown that a clear statement of goals is necessary in order to formulate a realistic objective function. To speak of 'optimizing' such a function in a general urban sense is overly ambitious at this time because of the severity of the constraints on the system. Consideration of the general issues in a systems framework is useful because it focuses on the important problem areas so that fruitful debate can occur. (Bell-Cornell)
W73-14905

WATER PLANNING MODELS IN NORTH ATLANTIC STUDY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W73-14908

APPRAISAL OF THE WATER RESOURCES OF CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-14996

SUMMARY OF A REPORT TO THE SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT ON THE BAYLANDS SALT WATER FLOOD CONTROL PLANNING STUDY.
Santa Clara County Flood Control and Water District, San Jose, Calif.
For primary bibliographic entry see Field 04A.
W73-15020

AN INVENTORY AND ANALYSIS OF EXISTING STORM DRAINAGE SYSTEMS IN THE TOLEDO REGIONAL AREA.
Lucas County Office of the Engineer, Toledo, Ohio.
For primary bibliographic entry see Field 04A.
W73-15021

UTILITY DISTRICT ANTICIPATES FUTURE WATER NEEDS,
East Bay Municipal Utility District, Oakland, Calif.
For primary bibliographic entry see Field 06D.
W73-15023

THE BATH STORY - NEW KENNEBEC RIVER SUBAQUEOUS WATER MAIN,
Fay, Spofford, and Thorndike, Inc., Boston, Mass.
For primary bibliographic entry see Field 08A.
W73-15025

CONTROL OF WATER RESOURCES QUALITY: ADMINISTRATIVE ASPECTS,
Thames Conservancy, London (England).
For primary bibliographic entry see Field 05G.
W73-15028

MEANDERING RIGHTS FOR CONTRACTED WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W73-15143

WATER AND SEWERAGE DEVELOPMENT PLAN, KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City Region, Mo.
For primary bibliographic entry see Field 05G.
W73-15198

A PLAN FOR WATER AND SEWER, (CHATHAM COUNTY - SAVANNAH).
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.
For primary bibliographic entry see Field 05G.
W73-15199

MUNICIPAL SEWAGE TREATMENT SYSTEMS--INVENTORY OF THE STRUCTURE AND FUNCTIONS OF RHODE ISLAND'S PUBLIC SEWAGE TREATMENT SYSTEMS.
Rhode Island Water Resources Board, Providence.
For primary bibliographic entry see Field 05D.
W73-15200

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA-ADDENDUM NO 2.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 05G.
W73-15201

PRELIMINARY SEWER STUDY, VREDENBURGH, ALABAMA,
Alabama-Tombigbee Rivers Regional Planning and Development Commission, Camden.
For primary bibliographic entry see Field 05D.
W73-15204

METROPOLITAN DISTRICT WATER SUPPLY SYSTEM, HARTFORD, CONNECTICUT: DESIGN FEATURES OF THE WATER TREATMENT PLANT AT RESERVOIR SIX,
Hartford Metropolitan District Water Bureau, Conn.
For primary bibliographic entry see Field 05F.
W73-15206

3E. Conservation in Industry

WHITE WATER REUSE ON A FINE-PAPER MACHINE,
Western Michigan Univ., Kalamazoo. Dept. of Paper Science and Engineering.
For primary bibliographic entry see Field 05D.
W73-14920

KRAFT MULTISTAGE BLEACH PLANT EFFLUENTS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05B.
W73-14922

USE OF MIXED MEDIA IN WATER PLANT FILTRATION,
Mead Corp., Kingsport, Tenn.
For primary bibliographic entry see Field 05D.
W73-14924

WASTE WATER CLARIFICATION IN THE PAPER INDUSTRY THROUGH MODERN RETENTION AIDS (ABWASSERKLAERUNG IN DER PAPIERINDUSTRIE DURCH MODERNE RETENTIONSMITTEL),
Farbenfabriken Bayer A.G., Leverkusen (West Germany).
For primary bibliographic entry see Field 05D.
W73-14935

SHOULD INDUSTRY PURCHASE OR SEEK ITS OWN SUPPLY OF WATER,
New Jersey Dept. of Environmental Protection, Trenton.
R. L. Hardman, V. A. Appleyard, W. T. Laffey, L. Boehm, and R. H. Stewart.
Journal of the American Water Works Association, Vol 65, No 5, p 316-325, May, 1973. 10 photos.

Descriptors: *Industrial water, *Industrial wastes, Recirculated water, Cooling water, *Chemical industry, *Utilities, New Jersey, Ohio, Pennsylvania, *Water supply development.
Identifiers: *Steel industry, Chester (Penn.), Middletown (Ohio).

The trend by industrial plants to supply their own water rather than purchase from municipal water systems is examined in five separate subsections of this article, by authors who argue different viewpoints. Hardman reviews legislative controls over water supplies in New Jersey. The entire state is now under regulatory control for groundwater development. Users of ground and surface water in excess of 70 gpm are required to report monthly or daily usage. Since this appears to be larger than necessary to provide for normal true riparian uses it may be possible to reduce it to 35 gpm. Appleyard discusses the economic advantages for Chester, Pennsylvania, and for industries in industrial utilization of public water supplies. Laffey asserts that most industrial plants are

not interested in supplying and treating their own water because of high capital investment costs. Boehm explains that after consideration of four factors-- (1) cost of purchased water vs. own supply, (2) availability of each, (3) quantity and quality required, and (4) various uses of water within the plant--Armco Steel of Middletown, Ohio decided to provide its own water supply and treatment facilities. Finally, Stewart advances points similar to Boehm's which should be considered by industry before deciding on a private or public water supply. Additionally, utilities should consider unused capacity, stabilization of overall-load factor, potential demand, capital improvement costs, and potential revenues before servicing industries. (Stein-North Carolina)
W73-15026

TREATMENT AND DISPOSAL OF INDUSTRIAL WASTEWATERS,
Thames Conservancy, London (England).
For primary bibliographic entry see Field 05D.
W73-15205

3F. Conservation in Agriculture

MARGINAL VALUES OF WATER USED IN THE IRRIGATION OF CITRUS IN THE CENTRAL RIDGE SECTION OF FLORIDA,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
D. B. Wilder, III.
Available from the National Technical Information Service as PB-223 804, $7.00 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 88 p, 7 fig, 11 tab, 29 ref, 3 append. OWRR B-007-FLA (5). 14-31-0001-3267.

Descriptors: *Water allocation (Policy), Water values, Water utilization, Water demand, Decision making, *Florida, *Citrus, Irrigation, Crop production, Marginal productivity, *Regression analysis, Marginal benefits, *Marginal costs.

The objective was to estimate the value of water used in the irrigation of citrus in the Central Ridge Section of Florida. Production functions were estimated to explain the relationship of irrigation water to citrus yields. Marginal value productivities were calculated from these estimated relationships. Two sources of data were used: yield and irrigation records for citrus plots at the Lake Alfred Agricultural Research and Education Center, and a citrus irrigation response study at Lake Alfred by R. C. J. Koo. Least-squares regression techniques were used to estimate response coefficients from yield data for the period of January, 1930, through June, 1956. The 1960-61 crop year through the 1967-68 crop year were used from the study made by Koo. Estimates of the marginal value of irrigation water per acre-inch for four selected time periods ranged from $7.23 to $148.39 for the plot data and from $6.51 to $20.64 for the study by Koo. (Morgan-Florida)
W73-14760

SOIL BACTERIA IN LAND-DRAINAGE WATER,
West of Scotland Agricultural Coll. Auchincruive (Scotland). Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-14823

THE ARAL SEA PROBLEM (PROBLEMA ARAL'SKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 04A.
W73-14852

WATER TABLE CONTROL WITH SUBSURFACE IRRIGATION,
North Carolina State Univ., Raleigh Dept of Biological and Agricultural Engineering
R. W. Skaggs.
Paper No. NA72-205 presented at 1972 Annual Meeting - North Atlantic Region, American Society of Agricultural Engineers, Univ. of Maryland, College Park, August 13-15, 1972. 22 p OWRR A-033-NC (5)

Descriptors: *North Carolina, *Irrigation design, *Subsurface irrigation, *Drainage systems, *Subsurface drainage, Soil-water-plant relationships, Surface-groundwater relationships, *Soil water movement, Water table, Coastal plains.

Field experiments were conducted to characterize soil-water movement during sub-irrigation on a Lumbee sandy loam soil. Results for the water table response to sub-irrigation are presented and compared to predictions from theoretical approaches. Solutions were presented for the water table response to sub-irrigation for both initially draining and horizontal profiles. Numerical procedures were used to solve a nonlinear differential equation for saturated soil-water movement. A solution to the linearized equation was also presented and compared to the numerical results. The results of experiments showed that water could be supplied to the root zone at a rate more than sufficient to satisfy plant needs for 7.5 and 15 m tile spacings. However, the response was too slow for the 30 m tile lines. Theoretical calculations showed that the suggested water table depth range of 60 to 90 cm could be maintained in this soil with a tile spacing of 19.1 m.
W73-14858

IRRIGATION CANAL SYSTEM CAPACITY DESIGN CRITERIA,
Harza Engineering Co., Chicago, Ill.
J. D. Earles.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR3, Proceedings paper No. 9973, p 227-235, September 1973. 1 fig, 2 tab, 4 ref.

Descriptors: *Canals, *Design, *Irrigation practices, *Land tenure, *Land use, Estimating, *Evapotranspiration, Irrigation systems, Irrigation water, Water requirements, Water delivery, Irrigation efficiency, Farms.
Identifiers: Capacity criteria, *Cropping patterns, *Iran (Khuzestan), Crop yield.

Estimates of peak period evapotranspiration requirements for projected cropping are used to determine the minimum capacities necessary for main and secondary canals. In irrigation project design, the peak period of consumptive use is the period during which the weighted average daily rate of evapotranspiration of the various crops grown in the project areas is at a maximum. Different crops may have their peak rates at different times. To provide water when and where needed, at minimum cost, a detailed evaluation is necessary to prevent over- and under-design of canals. Land tenure after project construction is an important factor in determining the required capacity of project irrigation canals. An example of this factor is demonstrated in the Khuzestan area of Iran which has undergone a recent change in Government land tenure policy. The policy of subdividing project lands into small parcels for lease or sale to farmers was changed to permit an agribusiness lease-type of operation during initial project development. This change caused an increase in the projected summer cropping intensities, resulting in higher peak irrigation water requirements. To deliver the additional water, canal capacity increases of up to 50 percent was required over the original design. (Bell-Cornell)
W73-14906

THE EFFECTS OF RAINFALL AND SHADE ON THE OCCURRENCE OF THREE MITE PESTS OF TEA IN CEYLON,
La Trobe Univ., Bundoora (Australia) Dept of Zoology
W. Danthanarayana, and D. J. W. Ranaweera
Ann Appl Biol. Vol 70, No 1, p 1-12, 1972. Illus.
Identifiers: Brevipalpus-Californicus, Calacarus-Carinatus, *Ceylon, *Mite pests, Oligonychus-Coffeae, Rainfall, Shade, *Tea.

Outbreaks of the red spider mite (Oligonychus coffeae Nietn.), the purple mite (Calacarus carinatus Green) and the scarlet mite (Brevipalpus californicus Banks) of tea were closely associated with the monthly rainfall pattern. Peak numbers occurred during the intermonsoonal dry periods. The relationship between mite numbers and the rainfall pattern suggested that control measures should commence at the end of the first month after the dry season begins. More red spider mites, but fewer purple mites, occurred on tea grown under shaded conditions. Observations on the relationship between scarlet mite numbers and shade were inconclusive. It is suggested that, in addition to direct effects of rainfall and shade, mite numbers are determined by certain biochemical processes that take place within the tea leaves.--Copyright 1973, Biological Abstracts, Inc.
W73-14940

WATER RESOURCES OF THE USSR. PROBLEMS OF THEIR EFFICIENT USE AND CONSERVATION (VODNYYE RESURSY SSSR. PROBLEMY IKH EFFEKTIVNOGO ISPOL'ZOVANIYA I OKHRANY),
For primary bibliographic entry see Field 06B.
W73-15006

SOME MEASURES OF AGRICULTURAL DROUGHT,
Agricultural Research Service, Beltsville, Md.
D. M. Hershfield, D. L. Brakensiek, and G. H. Comer.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 491-502, 1973. 7 fig, 3 tab, 7 ref.

Descriptors: *Droughts, *Climatology, *Distribution patterns, Meteorology, Agroclimatology, Water shortage, Statistics, Statistical methods, Data collections, Meteorological data, Climatic data, Weather data.

To a large extent agriculture exists in a climatic environment of uncertainty. This is particularly true in the mid-latitudes which experience a procession of highs and lows that move from west to east and give rise to daily weather changes. A normal climate, as given by the mean values, does not exist, and information concerning the extremes is often more important for agriculture than the average conditions. Thus, it is important to know how often such extremes occur. The frequency of dry-day sequences is proposed as a measure of agricultural drought. The occurrence and severity of the drought depends upon the length of the sequence in combination with the water content and water holding capacity of the soil and the water-use pattern of the crop. The observed distribution of dry-day sequences can be represented closely by the geometric distribution. Since the average sequence length is highly correlated with the number of precipitation days, the one parameter required for the geometric distribution can be obtained from data published in climatic summaries. (Knapp-USGS)
W73-15064

A METHODOLOGY FOR ANALYSING AGRICULTURAL DROUGHT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

V. J. Bidwell.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 515-522, 1973. 8 ref. NSF Grant GK-11564.

Descriptors: *Droughts, *Agroclimatology, *Mathematical models, Statistical models, Regression analysis, Least squares method, Water shortage, Data collections, Climatic data, Weather data.

The concept of agricultural drought is discussed in relation to some aspects of plant physiology. The relationship between hydrologic variables and agricultural products is considered a system and can be modeled on this basis. There are two important considerations in the construction of a model for droughts: (1) the model should predict zero yield when devastating conditions occur, for instance, no rain for two months; and (2) possible interaction between different time periods should be considered, to see if growth during a particular period is affected by water stress during a previous time period. The parameters can be evaluated by the method of nonlinear least squares. (Knapp-USGS)
W73-15066

INTERREGIONAL COMPETITION IN THE CATTLE FEEDING ECONOMY, WITH SPECIAL EMPHASIS ON ECONOMIES OF SIZE,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
R. A. Dietrich.
Texas Agricultural Experiment Station Bulletin B-1115, September, 1971, 55p, 8 fig, 39 tab. HM-2489.

Descriptors: *Feed lots, *Cattle, *Economics, *Size.
Identifiers: Regional production characteristics, Transportation rates, Least-cost shipment routes, Feed grains.

This study utilizes a multi-dimensional transhipment model to determine the least cost location and optimum levels of cattle feeding and fed-cattle slaughter among 27 specified regions in the 48 contiguous states to satisfy the demand for fed beef. Data showed that readily available supplies of feed grain and feeder cattle and economies of size in feedlot operations are of major importance in determining the optimum location and levels of cattle feeding. Models were also developed to sysytematically measure the effects of specified changes in regional feedlot size and projected 1975 regional feedlot sizes on the optimum regional location and levels of cattle feeding and slaughter. In addition, the study shows the least-cost shipment routes for feeder cattle, feed grains, fed slaughter cattle, and dressed fed beef to meet the demand requirements in the various sectors of the cattle feeding-fed-beef economy. (Wetherill-East Central)
W73-15184

INFLUENCE OF IRRIGATION ON OVERWINTER SURVIVAL OF THE PINK BOLLWORM,
Arizona Univ., Tucson. Dept. of Entomology.
J. E. Slosser, and T. F. Watson.
Environ Entomol. Vol 1, No 5, p 572-576, 1972.
Identifiers: *Bollworm (Pink), Cocoon, *Irrigation, Larvae, Moth, Pectinophora-Gossypiella, Soil moisture, Winter survival.

Winter survival of Pectinophora gossypiella (Saunders) was studied in relation to timing of irrigation treatments, with applications ranging from Jan. 5 to May 10, 1967, including a nonirrigated control and 2 methods of larval burial. Of 4200 larvae buried at the 6-in. soil depth, only 1.3% survived. No significant differences existed among irrigation treatments, but larval survival was significantly greater in buried bolls than in buried, free cocoons. Moth emergence appeared to be related to soil moisture and compaction. Approximately 75% of the moth emergence was suicidal, and significantly more males than females survived.--Copyright 1973, Biological Abstracts, Inc.
W73-15185

AUTOMATED IRRIGATION IS HERE,
Washington State Univ., Prosser. Cooperative Extension Service.
M. A. Hagood.
Agricultural Engineering, Vol 53, No 10, p 16-18, October 1972. 2 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Trickle irrigation, *Irrigation operation and maintenance, Irrigation systems, Furrow irrigation, Irrigation efficiency, Irrigation engineering, Water management (Applied), Automation, Distribution systems, Costs, Surface irrigation.

Displacement of rural Americans is an inevitable consequence of irrigation technology that will continue to displace inefficient equipment and labor; however, this new technology will add to the total growth, efficiency, and competitiveness of irrigated agriculture. Low-skilled labor is now being replaced with better trained, better paid, and more dependable managerial personnel. New irrigation systems make possible development of previously considered non-irrigable land. Trickle irrigation allows use of low quality water, as sprinkler irrigation allows waterflow management which can significantly affect sediment concentration, nutrient content, and overall water quality of return flows. Automation of surface systems in open channels maintains uniform water levels, in addition to a 30 percent savings in water use. The costs of owning and operating selected sprinkler systems are presented and as the beneficial aspects of type and automation level of various systems are discussed. (Bahre-Ariz.)
W73-15212

DIURNAL WATER STRESS IN PLANTS GROWN ON A COARSE SOIL,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Plant Industry.
B. A. Carbon.
Australian Journal of Soil Research, Vol 24, No 1, p 33-42, March 1973. 7 fig, 3 tab, 17 ref.

Descriptors: *Diurnal, *Moisture stress, *Plant growth, *Sorghum, Sprinkler irrigation, Crop production, Coarse sediments, Water supply, Irrigation effects, Plant physiology, Water utilization, Soil water, Evaporation, Leaves, Root zone.

Two hybrid sorghums were grown on coarse deep sand under various sprinkler irrigation regimes. Bulk soil water potentials under all treatments remained in the range of 0 to -1000 cm throughout the experiment. Data indicate that a low rate of supply of soil water in the root zone can impose significant stress on those plants even when soil water potential is greater than -1 bar. Measurements of leaf water potential showed a rapid diurnal change from no plant water stress at dawn, to large negative potentials in midafternoon. It is concluded that, at least in part, this stress is sufficient to cause reductions in growth and water use, bec use of the unavailability of soil water to meet the potential demand of the plant. Diurnal water stress at higher levels resulted in the yield and tiller number per plant being reduced, and the time to flowering of grain sorghum extended. It is further noted that although the surface layers were prone to direct evaporation to the atmosphere, and despite the high degree of plant water stress, soil water potentials remained in a -35 to -50 cm range. (Bahre-Ariz.)
W73-15216

AN ECONOMIC COMPARISON OF SHORT AND FULL SEASON COTTON PRODUCTION IN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
G. S. Willett, B. B. Taylor, and D. R. Buxton.
Arizona Agricultural Experiment Station, Research Report 269, August 1973, 15 p, 4 fig, 17 tab, 9 ref.

Descriptors: *Cotton, *Comparative costs, *Cost-benefit analysis, *Period of growth, *Crop production, Agronomic crops, Fiber crops, Field crops, Economics, Costs, Feasibility studies, Optimization, *Arizona, Irrigation, Insecticides, Return (Monetary).

Economic consideration of early versus late crop termination is studied to aid Arizona cotton producers. Under adopted assumptions, substantial net income changes accompanied termination alternatives (irrigation, insecticide application, defoliation, picking, and completion of harvesting and shredding). Assuming a base lint price of 40 cents, a 15 percent yield loss, and Salt River Project irrigation costs, early termination resulted in an annual per acre net income change that ranged from $16.24 (Alternative I) to -$68.20 (Alternative IV). The range becomes even wider when yield losses are allowed to vary from zero yield loss to 40 percent yield loss, indicating that advantages offered by early termination are highly dependent upon yield losses expected to accompany various termination dates. Full season cotton costs can be identified with sufficient precision, although additional returns that can be expected from these outlays is highly uncertained. Environmental, biological, and cultural factors in different locations and different time periods make it inadvisable to recommend that early termination is, or is not, a profitable practice. Assessment of each situation is up to the individual grower; however, guidelines are developed which indicate the change in profitability from early termination, noting the expected impact on business performance with the realization that substantial yield losses can be realized while still permitting increased profits. (Bahre-Ariz.)
W73-15217

DEW OVER INDIA AND ITS CONTRIBUTION TO WINTER-CROP WATER BALANCE,
Meteorological Office, Poona (India).
C. R. V. Raman, S. Venkataraman, and V. Krishnamurthy.
Agricultural Meteorology, Vol 11, No 1, p 17-35, January 1973. 7 fig, 2 tab, 14 ref.

Descriptors: *Dew, *Microenvironment, Seasonal, Frequency analysis, Rates, Water supply, Soil moisture, Soil moisture meters, Crop production, Crop response, Semiarid climates, Arid climates, Evaporation, Transpiration, *Water balance, Leaves, Absorption.
Identifiers: *India.

Dew observations made with Duvdevani recorders, at about 60 stations in India, 1968-1971, are analyzed to study seasonal frequency and total accumulation, to assess the extent to which dew accumulation could mitigate water deficiency in winter, and augment soil moisture for possible agronomic exploitation. Tabulated data from the sites distributed all over India provide dew measurement estimated by comparison of deposition patterns at various levels above ground. Dew relation to vegetation can be beneficial with absorption of dew by leaf surfaces for direct use by plant; reduction of transpiration for bedewed plants resulting in equivalent saving of soil moisture reserve; and water saturation from dew of a plant during night leading to significant photosynthesis during the early morning hours. With the above data an attempt is made to assess the extent of dew accumulation as a supplement to the moisture need of winter crops over India. Water stress was worked out for January, by measuring potential

evapotranspiration, normal precipitation for a selected network. Although dew was beneficial along networks with 3-7 mm measured, only 1-2 mm was recorded in dry-farming tracts, with moisture stress increasing southward from 50-80 mm around 27 degrees N to 125 mm near 12 degrees N. In semiarid and arid dry farming areas dew deposition is too small to contribute to soil moisture conservation. (Bahre-Ariz.)
W73-15220

COMPARATIVE DROUGHT RESISTANCE OF BOS INDICUS AND BOS TAURUS CROSSBRED HERDS IN CENTRAL QUEENSLAND. RELATIVE MORTALITY RATES, CALF BIRTH WEIGHTS, AND WEIGHT CHANGES OF BREEDING COWS,
Commonwealth Scientific and Industrial Research Organization, Rockhampton (Australia). Cattle Research Lab.
J. E. Frisch.
Australian Journal of Experimental Agriculture and Animal Husbandry, Vol 13, p 117-126, April 1973. 8 tab, 20 ref.

Descriptors: *Animal growth, *Dry seasons, *Nutrient requirements, *Cattle, *Drought tolerance, Livestock, Environmental effects, Breeding, Moisture stress, Growth rates, Water supply, Water shortage, Arid lands, *Australia, Drought resistance, Mortality.

The northern Australian beef industry is dependent on selection of various strains or breeds that have shown the ability to survive and produce efficiently in a region subject to prolonged periodic droughts and to poor nutrition during the dry season of most years. Weight changes and associated effects of drought on comparable groups of Zebu crossbred cows viewed at Belmont, Queensland, during a drought in 1969, were measured on all cows, with a consideration that about half of the cows calved over a two-month period from mid-October. All the cows were weighed three times, with the weights and weight changes of both the calving and non-calving groups following a similar pattern; though the weight changes of the non-calving group were of greater magnitude; the weights of the three crossbreds were the same at maturity, but achieved at different rates. During the drought, the purebred Brahmans lost the least and the purebred Africanders lost the most weight of all breeds. However, the nature of the data precludes drawing any strict comparisons. Mortality rates recorded 1960-1969 were generally highest for Shorthorn x Herford (SH), particularly in the drought years of 1965 and 1969. Reasons which might explain the differences in performance of the breed types are presented. (Bahre-Ariz.)
W73-15221

THE EMERSON DISPERSION TEST AND ITS RELATIONSHIP TO HYDRAULIC CONDUCTIVITY,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 02G.
W73-15222

PLANT MOISTURE STATUS EFFECTS IN ESTIMATION OF EVAPORATION BY A COMBINATION METHOD,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 02D.
W73-15223

SOLID SET SPRINKLER IRRIGATION,
California Univ., El Centro. Imperial Valley Field Station.
F. E. Robinson.
Agricultural Engineering, Vol 53, No 4, p 15-16, April 1972. 4 fig, 5 tab.

Descriptors: *Sprinkler irrigation, *Irrigation practices, Crop production, Arid climates, *California, Spatial distribution, *Vegetable crops, Salt balance.
Identifiers: *Imperial Valley.

In the arid Southwest where irrigation is a necessity, large increases in Long Imperator carrots, Climax lettuce, Calicel lettuce, Scarlet Globe radishes, and Yellow Granex onions have been made possible by sprinkler irrigating plants grown in flat beds using grid spacings with two inch variance ranging from 10x10 to 24x24. Sprinkler irrigation is important in the arid Southwest to prevent salt accumulation on the seed row surface until the seeds emerge. After emergence, the seedlings are then furrow irrigated, allowing the portable solid set sprinklers to be used in another field. Research indicates that if all irrigation were done by sprinklers, the furrows could be eliminated. Plants are being grown in various grid patterns to identify those that produce the highest marketable yields at the highest degree of uniformity. (Bahre-Ariz.)
W73-15224

RICE CULTIVATION IN SOUTHERN KAZAKHSTAN KZYLKUMSKY RIDGE, (IN RUSSIAN),
Novocherkasskii Inzhanerno-Meliorativnyi Institut (USSR).
B. A. Shumarov, and A. G. Rau.
Dokl Akad S-Kh Nauk. 1 p 6-7, 1972, Illus.

Descriptors: Cultivation, *Irrigation, *Rice cultivation, Ridges, *USSR (Kazakhstan).

Five variations of UZROS-13 rice were used in a developmental study of growing conditions. The quantity of water consumed by the most suitable variant during the growing stages was 306-443 m3/quintal or 78-83% of the control group. The watering period was reduced to 10-15 days and irrigation norm to 2500-3000 m3/ha.--Copyright 1973, Biological Abstracts, Inc.
W73-15283

THE EFFECT OF DROUGHT, IRRIGATION AND MINERAL FERTILIZATION ON THE GROWTH OF THE ROOT SYSTEM OF SOYBEAN PLANTS, (IN RUSSIAN),
A. A. Babich.
Dokl Akad S-Kh Nauk 1 p 16-19, 1972, Illus.
Identifiers: *Drought, Fertilization, Growth, Irrigation, *Minerals, Plants, *Soybean root system.

Occasional short term drought in July and Aug. had no adverse effect upon the soybean plants. During drought years the root system growth of 3 cultivars increased and penetrated deeper into the soil than in other years. The depth of penetration and the strength of root development was also greatly influenced by irrigation and mineral fertilization.--Copyright 1973, Biological Abstracts, Inc.
W73-15285

INFLUENCE OF IRRIGATION ON THE YIELD AND PERSISTENCE OF FORAGE LEGUMES,
Ministry of Agriculture and Lands, Kuala Lumpur (Malaysia). Div. of Agriculture.
H. A. Wahab, and D. S. Chamblee.
Agron J. Vol 64, No 6, p 713-716. 1972.
Identifiers: Coronilla-Varia, Disease, *Forage legumes, *Irrigation, Legumes, Medicago-Sativa, Trifolium-Repens, *Crop yield, Alfalfa, Clover, Crownvetch, Soil moisture.

The effect of irrigation on the yield of 3 alfalfa (Medicago sativa L.) cultivars, corwnvetch Coronilla varia L.) and ladino clover (Trifolium repens L.) was studied in the field over a 2-yr period. The nonirrigated plants received natural precipitation, whereas the irrigated legumes were supplied with supplemental water in addition to the rainfall whenever soil moisture was depleted to approximately 50% of the available water holding capacity. At the first harvest after irrigation in the first yr, superior growth of all legumes was obtained by the use of supplemental water. The benefits of irrigation to some species and cultivars ended at this point. Yields of alfalfa were sharply reduced in mid- and late summer of the second yr as a result of irrigtion. Irrigation of the 3 alfalfa varieties resulted in an overall decrease in yield of 76% at the last harvest. The alfalfa varieties responded differentially to irrigation. Most of the stand of crownvetch was lost following the first cut on the irrigated plots. In contrast to other legumes, irrigation increased the yields of ladino clover by approximately 19%. Severe infestation by several diseases was probably a primary factor in the severe stand loss and low yields of alfalfa and crownvetch under irrigation. Excessive soil moisture due to precipitation soon after irrigation also possibly contributed to the loss of alfalfa stands.--Copyright 1973, Biological Abstracts, Inc.
W73-15295

STOMATAL RESISTANCE, NET PHOTOSYNTHESIS AND TRANSPIRATION IN PMA-TREATED SORGHUM: A FIELD STUDY,
Texas A and M Univ., Beaumont Agricultural Research and Extension Center.
J. W. Sij, E. T. Kanemasu, and I. D. Teare
Crop Sci. Vol 12, No 6, p 733-735. 1972. Illus.
Identifiers: Analyzers, Diffusion porometry, Phenylmercuric acetate, *Photosynthesis, *Sorghum-Bicolor, *Stomatal resistance, Transpirant, *Transpiration.

Diffusion porometry and a field-chamber system were employed to study the effects of single applications of 90-720 micro M phenylmercuric acetate (PMA) on stomatal resistance, photosynthesis, and transpiration in field-grown sorghum (Sorghum bicolor (L.) Moench). To maintain increased stomatal resistance up to 20 days it was necessary to apply at least 360 micro M PMA. In short-term studies of 3-4 days post-treatment, photosynthesis was reduced (at least temporarily) more than was transpirations by PMA concentrations that produced prolonged effects on stomata. Diffusion porometry and field chambers can be used to test other antitranspirants applied to field-grown crops.--Copyright 1973, Biological Abstracts, Inc.
W73-15300

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

ANALYSIS OF MULTIPLE-INPUT STOCHASTIC HYDROLOGIC SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14753

LOCATION, IDENTIFICATION, AND CHARACTERIZATION OF PATHOGENS OF THE WATER HYACINTH,
Florida Univ., Gainesville. Dept. of Plants Pathology.
For primary bibliographic entry see Field 05C.
W73-14758

ENERGY AND FLOW REQUIREMENTS FOR CHOPPING WATER HYACINTHS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.

S. Stewart, III.
vailable from the National Technical Informa-on Service as PB-223 908, $4.75 in paper copy, .45 in microfiche. Master's Thesis, 1972. 47 p, 9 g, 4 tab, 17 ref. OWRR A-017-FLA (4). 14-31-001-3809.

escriptors: *Aquatic weed control, Drying, hemical analysis, Nutrients, Digestion, Aquatic eeds, *Water hyacinth, Rooted aquatic plants, nimal physiology, Toxins, Feeds, *Equipment, arvesting.
dentifiers: *Harvesting (Aquatic weeds), *Har-estors (Machinery).

he object was to investigate the flow and energy quirements for chopping fresh water hyacinths. he basic unit tested was an International 350 orage Harvester. The machine has both a feed echanism and a cutting unit. For this study the vo were powered through separate sources so ch could be varied independently. Tests were nducted using various feed rates, lengths of cut, eed of cutting blades, discharge conditions, feed echanisms and sheer bar clearance. The capacity the forage harvester was more dependent upon e feeding mechanism than the power available to ive the unit. The average horsepower consumed as related to the feed rate expressed in tons per inute by the formula P ± 35.2 F + 2. The capaci-of the unit could be increased with a different pe of feed mechanism. (Morgan-Florida)
73-14759

IVER BASIN SIMULATION AS A MEANS OF ETERMINING OPERATING POLICY FOR A VATER CONTROL SYSTEM,
lorida Univ., Gainesville. Dept. of Food and esource Economics.
or primary bibliographic entry see Field 06B.
73-14761

IMULATION OF THE QUANTITY AND UALITY OF FLOW IN A RIVER BASIN,
innesota Univ., Minneapolis. St. Anthony Falls ydraulic Lab.
or primary bibliographic entry see Field 02A.
73-14765

A COMPUTER-IMPLEMENTED INSTRUC-IONAL GAME FOR EVALUATING WATER ANAGEMENT ALTERNATIVES,
irginia Polytechnic Inst. and State Univ., lacksburg. Dept. of Fisheries and Wildlife ciences.
or primary bibliographic entry see Field 06B.
73-14772

HE VALUE OF RESERVOIR RECREATION,
ornell Univ., Ithaca, N.Y. Dept. of Agricultural conomics.
or primary bibliographic entry see Field 06B.
73-14775

IETHOD AND MEANS FOR THE WATER TRANSPORT OF LIQUIDS,
or primary bibliographic entry see Field 05G.
73-14780

EOHYDROLOGY OF THE CROSS-FLORIDA ARGE CANAL AREA WITH SPECIAL EFERENCE TO THE OCALA VICINITY,
eological Survey, Tallahassee, Fla.
or primary bibliographic entry see Field 08B.
73-14807

LOOD CONTROL IN RESERVOIRS AND TORAGE POUNDS,
heffield Univ. (England).
. J. Sarginson.
ournal of Hydrology, Vol 19, No 4, p 351-359, ugust 1973. 2 fig, 3 tab, 6 ref.

Descriptors: *Flood control, *Flood routing, Hydrographs, Routing, Equations, Flood forecasting, Reservoirs, Reservoir operation, *Spillways.

By approximating a natural flood hydrograph to a single mathematical curve, the routing procedure may be reduced to a dimensionless differential equation. The computer solution, in the form of a pair of tabulated functions, enables the length of spillway necessary to produce any desired reduction in the peak flood or any desired limiting head on the spillway to be obtained in a single calculation. Only a very slight modification of the procedure is necessary to deal with a spillway having a variable coefficient, or with a reservoir having a variable surface area. (Knapp-USGS)
W73-14832

TESTING OF METHODS FOR DETERMINATION OF URBAN RUNOFF,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
C. N. Papadakis, and H. C. Preul.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 9987, p 1319-1335, September 1973. 9 fig, 2 tab, 19 ref. EPA Grant 11024 DQU.

Descriptors: *Urban hydrology, *Urban runoff, *Storm runoff, *Reviews, Urbanization, Storm water, Cities, Rational formula, Mathematical models, Rainfall-runoff relationships, *Urban drainage, Model studies.

A brief review of methods developed for the calculation of urban storm-water runoff is presented. The Chicago Method, the Road Research Laboratory Method, the EPA Storm Water Management Model, and the University of Cincinnati Urban Runoff Model were tested in three urban watersheds: Chicago 10-acre tract, Oakdale 12.9-acre drainage area, and Bloody Run 2,380-acre urban watershed. All four methods successfully simulate storm-water runoff hydrographs in the case of the two small drainage areas. Runoff hydrographs obtained from (EPA) Storm Water Management Model and the University of Cincinnati Urban Runoff Model are compared with recorded hydrographs at the outlet of the Bloody Run Sewer Watershed at Cincinnati, Ohio. The estimate of the infiltration capacity to be used in these models is of predominant importance in the case of large urban drainage areas. (Knapp-USGS)
W73-14835

RAINFALL EXCESS MODEL FROM SOIL WATER FLOW THEORY,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02G.
W73-14836

BOTTOM WITHDRAWAL OF VISCOUS STRATIFIED FLUID,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh, and P. L. Monkmeyer.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 10018, p 1401-1419, September 1973. 5 fig, 18 ref, append. FWPC Grant 5Fl-WP26, 072-03.

Descriptors: *Stratified flow, *Density stratification, Numerical analysis, Reservoir releases, *Withdrawal, Viscous flow, *Sinks, *Hypolimnion.

A theoretical study was made of the fundamental behavior of nondiffusive, viscous flow to a sink located at the bottom of a density-stratified reservoir. The governing partial differential equation was transformed into an ordinary differential equation by utilizing a similarity technique. Numerical and series solutions predict a flow field characterized by a withdrawal layer near the reservoir bottom moving toward the sink. This layer is bounded above by a narrower reverse flow with a much smaller volumetric discharge. Normalized profiles of horizontal velocity, vertical velocity, and horizontal shear are similar, that is they have shapes that are independent of the fluid and flow parameters. Mathematical expressions were developed for various aspects of the fluid motion such as horizontal and vertical velocity, horizontal shear, withdrawal layer thickness, and the distribution of flow within the withdrawal layer. (K-napp-USGS)
W73-14837

LOG-NORMAL STREAMFLOW GENERATION MODELS REEXAMINED,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14838

SUBCRITICAL KINEMATIC FLOW IN A STABLE STREAM,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 02E.
W73-14839

SEEPAGE INTO SHEET PILE COFFERDAM,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-14843

PROBLEMS OF RESERVOIR CONSTRUCTION AND COMPLEX USE IN THE USSR (PROBLEMY SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA VODOKHRANILISHCH V SSSR),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 08A.
W73-14851

THE ARAL SEA PROBLEM (PROBLEMA ARAL'SKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
D. V. Korenistov, S. N. Kritskiy, M. F. Menkel', and I. Ya. Shimel'mits.
Vodnyye Resursy, No 1, p 138-162, 1972. 6 fig, 3 tab, 29 ref.

Descriptors: *Lakes, *Lake basins, *Water resources, *Water resources development, *Water management (Applied), Water utilization, Consumptive use, Water supply, Irrigation practices, Diversion, Runoff, Water loss, Water level fluctuations, Economics, Forecasting, Maps.
Identifiers: USSR, *Aral Sea.

In recent years there has been a rapidly growing interest in the Aral Sea as a result of development of productive resources in the Aral Sea basin and increasing use of irrigation water in the Syradar'ya and Amudar'ya River basins. Attention is focused on the status and development of water management in these basins, and a forecast is prepared of fluctuations in the level of the sea for a 15-year period between 1971 and 1985. Research on the Aral Sea is classified into three categories: (1) water resources of the Aral Sea basin and problems of their rational use; (2) regime of the Aral Sea during reduced inflow of stream waters, and effect of lowering of the surface level of the sea on environment and economy of the region; and (3) diversion of runoff from Siberian rivers to Soviet Central Asia and its effect on the sea's regime. (Josefson-USGS)
W73-14852

THE RADIATION AND ENERGY BALANCES OF CONIFEROUS AND DECIDUOUS FORESTS,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
For primary bibliographic entry see Field 02I.
W73-14870

THE EFFECTS OF HARVESTING AQUATIC MACROPHYTES ON ALGAE,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.
W73-14888

PLANNING THE DEVELOPMENT OF THE NESTOS RIVER,
COBA-Consulpresa, Lisbon (Portugal).
J. L. Serafim, J. Arez, W. Haley, and P. CunhaeSerra.
Water Power, The International Journal for Hydroelectric Development, Vol 25, No 6, p 228-234, June 1973. 12 fig, 1 tab, 3 ref.

Descriptors: *Water resources development, *Simulation analysis, *Cost-benefit analysis, Computer programs, *Hydroelectric power, *Reservoir operation, Watersheds (Basins), *River basins, Operations research, Mathematical models, Optimization, Damsites, Volume, Irrigation water, Supply, Constraints, Powerplants.
Identifiers: *Nestos River basin (Greece-Bulgaria), Operation rules.

Optimizing the water resources of a watershed, or a region of a country, necessitates finding the best reservoirs from the point of view of volume and serviceable damsites. Such conditions should be searched for intensively along the river, and topographical and photogrammetric data should be carefully studied. The Nestos River basin, found in Greece and Bulgaria, has been analyzed for the optimum development of its water resources. The aim is the development of the River for hydroelectric power, subject to an irrigation water supply constraint. Presented are detailed results of this analysis, and the mathematical simulation and cost-benefit analysis used to derive the optimum operating policy are described. The results allow for a selection of the unique combination of variables which define the best river development, such as type of scheme, dam heights, and installed capacities. A model incorporating operation rules has been formulated to simulate the operation of the reservoirs and power plants over a time period using river flow records. This model calculates the cost of the project, determines the value of the power and energy output, and so provides a cost-benefit analysis of the particular scheme under analysis. The model has been translated into a computer program in Algol, run on a Univac 1108, and is a collection of sub-routines described in detail. (Bell-Cornell)
W73-14907

MULTILAKE RIVER SYSTEM OPERATION RULES,
New York State Dept. of Environmental Conservation, Albany. Water Management Planning.
C. Liu, and A. C. Tedrow.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Proceedings paper No. 10021, p 1369-1381, September 1973. 8 fig, 1 tab, 10 ref, 3 append.

Descriptors: *River systems, *Lakes, *Dynamic programming, *New York, *Reservoir operation, Optimization, Hydraulics, *Multiple-purpose projects, Management, Water requirements, Systems analysis, Mathematical models, Equations, Cost analysis, Inflow, Computer programs.
Identifiers: Operation rules, *Oswego River System (NY), Finger Lakes (NY), Multiple regression analysis, Multivariable pattern search technique, Random sampling.

Seasonal operation rules for a multilake river system under multiuse requirements are derived utilizing a combination of dynamic programming and the multivariable pattern search technique. The model is formulated to handle linear and nonlinear objective functions. With the application of a river systems transition function, the optimization problem is reduced from a three-decision to a two-decision vector problem. The problem of dimensionality is resolved by employing functional equations expressed in analytical form; multiple regression analysis and random sampling techniques add to the computation efficiency and accuracy of the analysis. The application to the Oswego River System with five major lakes in system-basis operation is described. Two sets of lake-system operating rules are established from the analysis: The lake rule curves and the lake-use priority curves. The effects of system inflow variations and system operation measuring criteria upon the rules are also examined. (Bell-Cornell)
W73-14909

SIMULATION IN WATERSHED PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99 No HY9, Proceedings paper No. 10020, p 1383-1399, September 1973. 3 fig, 17 ref.

Descriptors: *Watershed management, *Simulation analysis, *Flood control, Hydraulics, Planning, *Water management (Applied), Watersheds (Basins), Hydrology, Flood plains, Computer programs, Digital computers, Surface waters, Mathematical models, Systems analysis, *Wisconsin.
Identifiers: *Milwaukee River (Wis).

Hydraulic and hydrologic simulation is an effective technique in comprehensive watershed planning and in subsequent plan implementation. The need and rationale for simulation are considered, as is the use of existing readily available computer programs. Examples drawn primarily from completed watershed studies illustrate how simulation may be utilized during the watershed planning process for: Floodland delineation, computation of monetary flood damages, evaluation of hydraulic adequacy of river crossings, analysis of structural flood control alternatives, determination of land use effects, and synthesis of low flows. Applications of simulation in plan implementation include: Floodway determination, encroachment studies, provision of design data for river crossings, preparation of flood insurance reports, incorporation of improved mapping and watershed changes, dissemination of flood hazard information, and flood forecasting. Much of the material is drawn from the watershed planning and implementation efforts of the Southeastern Wisconsin Regional Planning Commission. (Bell-Cornell)
W73-14910

LEAST-COST DESIGN OF WATER DISTRIBUTION SYSTEMS,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
T. Watanatada.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Proceedings, paper No 9974, p 1497-1513, September 1973. 5 fig, 3 tab, 21 ref, 2 append.

Descriptors: *Water distribution (Applied), *Pipes, *Design, *Cost-benefit analysis, *Water supply, Hydraulics, *Networks, Optimization, Engineering, Systems analysis, Mathematical models, Equations.
Identifiers: *Nonlinear programming, Cost minimization, Waterworks, Sensitivity analysis.

A least-cost method for designing water distribution systems is presented. It is a computer-based automatic design method which, given a network configuration, will simultaneously compute the pipe sizes and pumping capacities that minimize the total cost, while satisfying the demand requirements. Basically, the behavior of a network obeys two physical laws: (1) The conservation of headloss around any loop, and (2) the continuity of fluid flow at any pipe junction. From these physical laws and from the performance criteria that the pressure at the delivery points of the network must be above a specified level, a nonlinear programming problem is formulated, in which the cost of the system is to be minimized subject to equality and inequality constraints. Because of their simplicity, the inequality constraints are eliminated by a transformation of Box, from which Haarhoff and Buys' method for equality constraints is used to solve the remaining part of the problem. The computer program can readily handle existing or predetermined system components and can account for the cost of supplying water at the source nodes. Various sensitivity analyses are made on a model network, yielding results which can be useful to complex systems. Tests have shown that the method produces significantly more economical results than conventional designs. (Bell-Cornell)
W73-14911

CHANGES IN FLOODFLOW CHARACTERISTICS OF A RECTIFIED CHANNEL CAUSED BY VEGETATION, JACKSON, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 02E.
W73-14995

SPECIFIC CHARACTER OF THE STRUCTURE AND DYNAMICS OF RESERVOIR WATER MASSES (O SPETSIFICHNOSTI STRUKTURY I DINAMIKI VODNYKH MASS VODOKHRANILISHCH),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 02H.
W73-15008

PATTERNS OF VARIABILITY OF RIVER RUNOFF AS A BASIS FOR A THEORY OF ITS REGULATION AND USE (ZAKONOMERNOSTI KOLEBANIY RECHNOGO STOKA KAK OSNOVA TEORII YEGO REGULIROVANIYA I ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
S. N. Kritskiy, and M. F. Menkel'.
Vodnyye Resursy, No 2, p 113-137, 1972. 4 fig, 2 tab, 50 ref.

Descriptors: *Runoff, *Variability, *Fluctuations, *Regulation, *Water utilization, Streamflow, Discharge (Water), Runoff forecasting, Analysis, Mathematical studies, Probability, Stochastic processes, Statistics, Curves.
Identifiers: USSR.

Original hydrologic concepts serving as a basis for the modern theory of water regulation and use are examined. Role of the doctrine of streamflow in the general theory of water management is defined, and attention is focused on predicted trends in modern hydrologic analysis. Sources of information on runoff and methods of expanding and refining this information are discussed. Patterns of runoff variability are analyzed, and the possibility of studying natural long-term fluctuations of runoff as a stationary stochastic process is justified. Methods of mathematical expression of random runoff fluctuations are presented, and the growing need to consider anthropogenic influences on runoff in hydrologic investigations is noted. Long-term runoff fluctuations of the Dnieper, Danube, and Rhine Rivers and water

discharges during first and second halves of their observation periods are graphed. (Josefson-USGS)
W73-15010

DAYS CREEK LAKE PROJECT, SOUTH UMPQUA RIVER, DOUGLAS COUNTY, OREGON, (FINAL ENVIRONMENTAL STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.

September, 1972. 118 p, 2 maps, 10 ref, 2 append.

Descriptors: *Damsites, *Environmental effects, *Oregon, Reservoirs, Salmonids, Flood control, Augmentation, Rockfill dams.
Identifiers: *Environmental Impact Statements, Chinook, Umpqua, South Umpqua, Douglas County (Ore.), *Days Creek (Ore).

The environmental effects are assessed of a proposed rockfill dam which would create a 480,000 acre-foot, multiple-purpose reservoir, primarily for flood protection in the Umpqua Basin. Adverse environmental impacts include inundation of 16 miles of main stream and 14 miles of tributary stream, with total land and water area of 4,270 acres, and loss of wildlife habitat including natural spawning grounds for 3,350 anadromous salmonids. Positive effects include flood protection; 1,200 acres acquired as part of the project for wildlife habitat; downstream water quality improvement; and enhancement of recreation, fish life and aesthetics resulting from use of the reservoir for low flow augmentation. Water above the dam would also be used for recreation, municipal and industrial water supply, and irrigation. Population of salmonids and spring chinook would be greatly increased. Single-purpose alternatives of flood plain zoning, evacuation, levees, dry reservoir operation, alternative means of irrigation and water supply, and multiple-purpose alternatives of dams with other sites, sizes and types were considered, but were rejected. Included is a summary of comments from 39 Federal, State and local public agencies, conservation groups and individuals, along with responses by the Corps of Engineers. Comments overwhelmingly favored the project, although much support was qualified pending results of turbidity studies and analysis of the final impact statment. Comments received, selected bibliography and project maps are appended. (Stein-North Carolina)
W73-15017

SUMMARY OF A REPORT TO THE SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT ON THE BAYLANDS SALT WATER FLOOD CONTROL PLANNING STUDY.
Santa Clara County Flood Control and Water District, San Jose, Calif.

January, 1973. 22 p, 6 fig, photos.

Descriptors: *Flood protection, *Land subsidence, *Salt marshes, *Seashore, *Levees, Flood control, Environmental effects, Sea level, Sea water, Land use, Freshwater, *California, Regional analysis.
Identifiers: *Santa Clara County (Calif.), Baylands, San Francisco Bay.

The purpose was to develop information that would assist in deciding whether the Santa Clara Flood Control and Water District should expand its responsibilities to include protection of Baylands from salt water flooding and how this might be accomplished. Large portions of the Baylands study area are subject to salt water flooding, and in some instances freshwater flooding also. Substantial land subsidence has occurred previously, and is expected in the future. Flooding has become a problem of increasing concern because intensive utility, military, industrial and residential activities have located in portions of the low-lying Baylands. Much of the original tidal grasslands and floodplains have disappeared, modified first to stock pasturage and hay farms, then to truck gardens and orchards, and most recently to more urban uses ringed by freeways. Existing levees of mixed earthwork were constructed primarily to enclose salt ponds, and are located inboard and outboard of the ponds, bounding some 7,600 acres of land and 8,300 acres of wetlands respectively. Agencies with planning and regulatory powers over the study area include the San Francisco Bay Conservation and Development Commission, the Army Corps of Engineers, and the Planning Policy Committee of Santa Clara County. Three alternative plans are considered, including a no action possibility, a system of inboard levees, and a system of outboard levees. The costs for each are noted. Recommendations or conclusions are not included, relevant maps and photos are included. (Edwards-North Carolina)
W73-15020

AN INVENTORY AND ANALYSIS OF EXISTING STORM DRAINAGE SYSTEMS IN THE TOLEDO REGIONAL AREA.
Lucas County Office of the Engineer, Toledo, Ohio.

Available from the National Technical Information Service, Springfield, Va. 22151. Prepared for the Toledo Regional Area Plan for Action, September, 1969. 90 p, 3 fig, 4 plates, 9 ref, 1 append. HUD-Ohio P-47.

Descriptors: *Urban runoff, *Drainage systems, *Government finance, *Floods, *Ohio, Combined Sewers, Open channel flow, Mapping, Urbanization, Storm runoff, Regional analysis.
Identifiers: *Toledo (Ohio).

Flat terrain and broad interstream areas means that the Toledo Regional Area has practically no natural drainage. Urbanization has aggravated this problem by increasing flood water levels and reducing channel capacities. The information presented provides the basis for solving immediate drainage problems, guiding new development to those areas amenable to good drainage, and planning for future drainage. Subject areas include: planning and financing storm drainage facilities, general standards for storm drainage systems, mapping of watershed areas, computation of storm water runoff and water surface elevations. The inadequacy of combined sewers during times of flood is pointed out. A master plan is clearly needed for coordinated future action. A tabulation of existing conditions of the major storm drainage outlets appears in the appendix. (Hoffman-North Carolina)
W73-15021

THOUGHTS ON THE DESIGN OF DESIGN FLOODS,
For primary bibliographic entry see Field 02E.
W73-15031

APPLICATION OF THE METHOD OF GRADEX,
Electricite de France, Grenoble. General Technical Div.
For primary bibliographic entry see Field 02E.
W73-15033

HYPOTHESES ON THE SEASONAL DISTRIBUTION OF THUNDERSTORM RAINFALL IN SOUTHEASTERN ARIZONA,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02B.
W73-15036

ANALYSIS OF UNITGRAPH METHOD OF FLOOD SYNTHESIS BY SHALLOW WATER EQUATIONS,
Geneva Coll., Beaver Falls, Pa. Dept. of Engineering.
For primary bibliographic entry see Field 02A.
W73-15038

REMOVAL OF UNIT HYDROGRAPH OSCILLATIONS BY FILTERING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15040

FLOOD EVALUATION BY SOME DATA GENERATION TECHNIQUES,
Birmingham Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15041

PREDICTION OF RESERVOIR FILLING FOR STREAMS SUBJECT TO ERRATIC FLOODS,
Centrais Electricas de Sao Paulo (Brazil). Div. of Hydrology.
F. de Gennaro Castro.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, 213-217, 1973. 3 fig.

Descriptors: *Reservoir design, *Streamflow forecasting, Statistical methods, Probability, Water yield, Flood forecasting, Model studies.

A technique to predict reservoir filling in a predesign stage, particularly under erratic flood conditions utilizes the differential mass diagram in an inverse relationship of that ordinarily considered for regulation studies. The set of results, after simple statistical treatment, is plotted in one graph that shows the probability of carrying on the operation under two combined conditions: (a) one particular month as the month chosen to start with the reservoir filling; and (b) a given period as the length of time required to fill the reservoir. (Knapp-USGS)
W73-15043

PRACTICAL DECISION RULES IN RESERVOIR OPERATION,
Universidad Nacional Autonoma de Mexico, Mexico City.
F. G. Villarreal, and H. Garduno.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 218-229, 1973. 6 fig, 10 ref.

Descriptors: *Reservoir operation, *Reservoir yield, *Electric power, *Flood control, Systems analysis, Mathematical models, Flood recurrence interval, Flood frequency, Mexico.
Identifiers: *Mexico City (Mexico).

Systems analysis techniques were applied to the operation of a 716 MW hydroelectric plant in Mexico City served by a reservoir with flood control as a second purpose. Also, the models developed were applied to a multireservoir, multipurpose water resources system. The historical annual maximum floods were synthesized using a modified Gumbel frequency analysis in order to generate hydrographs with different return periods. These return periods, associated with a particular operating horizon of the reservoir produce a simple chart which explicitly shows the flooding risk associated to a given maximum operation level. (Knapp-USGS)
W73-15044

FLOOD CONTROL POLICIES DEVELOPED BY SIMULATION,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
E. J. Plate, and G. A. Schultz.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 246-258, 1973. 2 fig, 7 ref.

Descriptors: *Flood control, *Reservoir operation, *Simulation analysis, Optimization, Systems analysis, Flood protection.
Identifiers: *Germany.

In the densely populated Federal Republic of Germany, complete flood control is in most cases not attainable due to prohibitively high costs of land or of resettling. Consequently, flood retention space is the limiting factor in flood control planning. Optimal utilization of the available space requires a policy of releases from reservoirs which become more complex the more reservoirs are in the system. The only promising approach to the problem of obtaining optimal operating rules for a system of reservoirs lies in the application of simulation techniques. A general procedure is given for solving this problem. From an ideal forecast the input event is predicted for the duration of the storm at the beginning of the storm. It should be known as function of space and time. With the input thus determined, the optimum release decisions must be calculated for each reservoir of the system and for each time interval. (Knapp-USGS)
W73-15047

FLOOD CONTROL PLANNING WITH INADEQUATE HYDROLOGIC DATA,
Malyiya Regional Engineering Coll., Jaipur (India). Dept. of Civil Engineering.
R. D. Verma, and R. M. Advani.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 259-268, 1973. 16 ref.

Descriptors: *Planning, *Flood control, *Flood frequency, *Design flood, Statistical methods, Probability, Data collections, Hydrologic data, Flood forecasting.
Identifiers: *Probable maximum flood, *India.

Flood-control planning requires determination and evaluation of all measures which are technically sound. Economics of the alternative flood control measures is a key to planning. Benefits and cost of flood-control projects depend upon the intensity and frequency of discharge for which the flood protection is provided. Flood-control planning with inadequate hydrologic data requires decision under uncertainty. It should be possible, even in the absence of adequate hydrologic data, to use the Gumbel's first asymptotic frequency distribution to calculate flood frequencies if one can determine the parameters of this distribution. The parameters can be determined if the intensities and return periods of minimum and maximum discharges of yearly floods can be estimated by making use of the meteorological records and the physiographic characteristics of the drainage basins. Also, it should be possible to estimate the probable minimum flood using rainfall and catchment data. If its estimation is not possible or is not reliable due to uncertain conditions and if the flood affected region does not regularly get flooded, its value also could be assumed to be equal to zero without causing much error. (Knapp-USGS)
W73-15048

LOG-PEARSON TYPE III AND GUMBEL ANALYSES OF FLOODS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15049

BEST FITTING OF PROBABILITY FUNCTIONS TO A SET OF DATA FOR FLOOD STUDIES,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 02E.
W73-15050

RELIABILITY OF ESTIMATES OF THE EXCEEDENCE PROBABILITY OF A GIVEN FLOOD MAGNITUDE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15051

A NEW PROPOSAL FOR COMPUTATION OF FLOOD FREQUENCY,
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
For primary bibliographic entry see Field 02E.
W73-15052

ANALYSIS OF RISKS AND UNCERTAINTIES IN FLOOD CONTROL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 363-374, 1973. 4 fig, 4 ref. NSF Grant GK-31512X.

Descriptors: *Flood control, *Risks, *Floods, Statistics, Statistical methods, Decision making, Economics, Optimization, Probability, Damages.

Some basic aspects of floods are reviewed with insights into possible avenues of improving the flood control decision process. A definition of basic risk, all types of uncertainties, and their combined total risk, is proposed. Flood damage functions as the basis for economic analysis of flood control and flood plain zoning are subject to large errors and represent a limiting factor on the reliability of decisions. A set of economic damage variables should be related to a set of flood characteristics, all random variables. Several new avenues are outlined for an overall decrease of risk by decreasing uncertainties in the estimation of flood characteristics. A false sense of security is often generated by constructing flood control works. Taking uncertainties into account by economic optimization is often a subjective approach. (Knapp-USGS)
W73-15056

OBJECTIVE REGIONALIZATION OF PEAK FLOW RATES,
Agricultural Research Service, Chickasha, Okla. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02E.
W73-15057

SOME METHODS FOR ESTIMATION OF FLOODS IN A TROPICAL AREA,
World Meteorological Organization, San Jose (Costa Rica). Central American Hydrometeorological Project.
For primary bibliographic entry see Field 02E.
W73-15058

WATERSHED FLOOD ROUTING USING DISTRIBUTED PARAMETERS,
Agricultural Research Service, Brookings, S. Dak.
For primary bibliographic entry see Field 02E.
W73-15059

SIGNIFICANCE OF THE GENESIS OF FLOODS ON PROBABILITY ANALYSIS,
Ebasco Services, Inc., New York
For primary bibliographic entry see Field 02E.
W73-15062

REGIONAL WATER EXCHANGE SYSTEM AS AN ALTERNATIVE FOR ALLEVIATING DROUGHT PROBLEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering
For primary bibliographic entry see Field 06B
W73-15070

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX I, CORRESPONDENCE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Tulsa, Okla.

Available from National Technical Information Service, U. S. Dept. of Commerce as PB-202 134-F-1 January 10, 1972. 376 p, 6 fig, 6 tab

Descriptors: *Arkansas, *Reservoirs, *Water resources development, *Environmental effects, Aquatic Environment, Aquatic habitats, Ecology, Flood control, Water control, Dams, Natural watercourses, Water conservation, Water supply, Public benefits, Federal project planning, Federal government
Identifiers: *Environmental Impact Statement.

This document is an appendix to the final environmental impact statement (EIS) prepared for the Gillham Lake dam project on the Cossatot River in Arkansas. It contains all correspondence regarding the project, ranging from letters between various governmental agencies setting up the testing procedures to letters from concerned citizens voicing their disapproval of the dam's construction. (See also W73-15138) (McKnight-Florida)
W73-15137

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX IV, APPENDIX V, APPENDIX VI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.

Descriptors: *Arkansas, *River systems, *Dams, *Environmental effects, Ecology, Legal aspects, Judicial decisions, Balance of nature, Habitats, Aquatic environment, Dam construction, Wildlife conservation, Flood protection.
Identifiers: *Environmental Impact Statements, *Injunctive relief, *National Environmental Policy Act, Standing (Legal).

This portion of a final environmental impact statement (EIS) contains primarily a transcript of court proceeding in the suit by the Environmental Defense Fund, Inc. and others to halt the construction of the Gillham Dam Project on the Cossatot River in Arkansas. The plaintiffs alleged that the defendants, the Corps of Engineers, were violating the National Environmental Policy Act (NEPA) by failing to prepare an environmental impact study required by the Act. The Corps of Engineers based their defense of the fact that the project in question had received Congressional approval in 1958, some eleven years before NEPA was passed. This, the defendants maintained, precluded the project from the necessity of compliance with NEPA as the Act was not intended to be applied retroactively. The court ultimately determined that NEPA must be complied with. Thus, in spite of the fact that the project was some 63% completed, it has to be halted pending the results of the detailed environmental impact study required by NEPA. Also included is a bibliography of literature cited in the text of the EIS and qualifications of the interdisciplinary personnel who

prepared the EIS. (See also W73-15137) (McKnight-Florida)
W73-15138

A COMPARATIVE VEGETATIONAL STUDY OF TWO NORTH-FACING SLOPES AT ROCK ISLAND STATE PARK, ROCK ISLAND, TENNESSEE,
J. Wooden, and D. Caplenor.
J Tenn Acad Sci. Vol 47, No 4, p 146-151. 1972. Illus.
Identifiers: Adiantum-Capillus-Veneris, Equisetum-Arvense, Ordination, Seepage, Slopes, *Tennessee (Rock Island), Trees, *Vegetation, *State parks.

Two plant communities on north-facing slopes adjoining the Caney Fork River below the Great Falls Dam in Warren County, Tennessee, were sampled using standard nested quadrats. The substrates of the 2 communities differed in that the one nearest the dam had continuous seepage through the underlying bluff from the impounded river above. There was considerable difference in the composition of the communities. Analysis by ordination and by simple coefficient of similarity indicated that the community without seepage was a rather typical mixed mesophytic community (sensu Braun). The tree layer of the community with seepage was found to be strongly influenced by a previous disturbance and was, therefore, judged not to be, at present, representative of the result of the effect of the seepage. Certain herbaceous plants in the seepage area (Adiantum Capillus-Veneris L. and Equisetum arvense L.) did indicate an effect of seepage.--Copyright 1973, Biological Abstracts, Inc.
W73-15141

COASTAL ZONE MANAGEMENT ACT: A BROADER SCOPE FOR STATE INITIATIVE,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 06E.
W73-15142

RIRIE DAM AND LAKE, WILLOW CREEK, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.

Available from the National Technical Information Service as EIS-ID-73-0276-F, $8.25 in paper copy, $1.45 in microfiche. October 6, 1972. III p, 8 pate, 7 photo, 3 tab.

Descriptors: *Idaho, *Environmental effects, *Flood control, *Dams, Recreation, Wildlife habitat, Irrigation, Agriculture, Water quality standards, Water quality control, Flood prevention, Water conservation, Rockfill dams, Water storage, Federal project policy, Project purposes, Federal government.
Identifiers: *Environmental Impact Statements.

The project site is located in the Willow Creek drainage in Bonneville County, Idaho and consists of the construction of a 251-foot high rockfill dam which will create a lake of 1,560 acres maximum size. Also included is a 7.8 mile long floodway channel. The major purpose of the project will be flood control with some benefits also accruing to recreation and irrigation. Total land requirements for the project will be 6,815 acres. Major impacts of the project will include the conversion of 12 miles of natural streambed to a fluctuating lake, reduction of flooding in the populated downstream areas, a change in landscape character, and loss of waterfowl and deer habitat. The project will cause the loss of about 10 percent of the total length of the natural Willow Creek channel. There will also be an interim loss of wildlife as well as adverse water quality effects. Alternatives include flood plain management, structural alternatives, a dam without a floodway channel, other damsites, and alternate floodway channel routes. The comments of interested governmental agencies are included. (Mockler-Florida)
W73-15162

DEEP WATER PORT POLICY ISSUES.
For primary bibliographic entry see Field 06E.
W73-15163

REPORT ON THE WATER LEVELS OF THE GREAT LAKES.
For primary bibliographic entry see Field 06E.
W73-15165

BRIEFING--MISSISSIPPI RIVER.

Hearing--Comm. on Public Works, U.S. House of Representatives, 93d Cong, 1st Sess, April 1973. 43 p, 13 map, 39 photo, 2 tab.

Descriptors: *Water levels, Water resources development, Planning, Floods, Forecasting, Discharge measurement, Data collection, *Mississippi River.
Identifiers: Levies, Spillways.

Testimony was taken and material received for the record detailing the situation in the lower Mississippi Valley as a result of the heavy flooding early in the year. Testimony was given to the effect that the Mississippi River and tributary flood control plan has substantially reduced damage and kept it minimal. Federal levees held back the flood waters whereas private ones failed, a situation attributed to a lack of engineering and proper construction among other factors. Floodways and spillways were opened and appeared to operate as designed. Many photographs and diagrams are included. (Wadley-Florida)
W73-15166

PRODUCTIVITY OF AN ARID ZONE SHRUB (EREMOPHILA GILESII) COMMUNITY IN SOUTH-WESTERN QUEENSLAND,
Charleville Pastoral Lab. (Australia).
For primary bibliographic entry see Field 02I.
W73-15219

A ZONAL LEAF SPOT OF WATERHYACINTH CAUSED BY CEPHALOSPORIUM ZONATUM,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 05C.
W73-15226

APHANOMYCES BLIGHT OF AMAZON SWORD PLANTS,
Florida State Dept. of Agriculture and Consumer Services, Gainesville.
For primary bibliographic entry see Field 05C.
W73-15227

A NATIONAL WATER GRID FOR INDIA.
Economic Commission for Asia and the Far East (UN), New York.

Water Resources Journal, United Nations Economic Commission for Asia and the Far East (ECAFE), p 1-17, December 1972. 5 fig.

Descriptors: *Water resources development, *Canals, *Inter-basin transfers, Water conveyance, Water supply, Flood control, Irrigation water, Water transfer, Planning.
Identifiers: *India.

India is studying proposals for the construction of a national water grid, of which one of the important components would be the Ganga-Cauvery Link Canal. The purpose of this project is to supply surplus and floodwater from the Ganga River during the monsoon months to regions in western, central, and southern India which are exposed to an unsatisfactory water regime and frequent droughts. Water will be drawn from the Ganga near Patna and lifted by means of large-scale pumping to a point near the divide between the basins of the Ganga and Narmada from where 10 to 20 million acre-feet can be distributed by gravity canal or by natural river courses either to the west or to the south. Surplus water of the Narmada and Godavari Rivers which is at present flowing to waste in the sea during the flood season will be used for augmenting supplies to the grid. The Ganga-Cauvery Link Canal, with a length of 1,500 to 2,000 mi would provide an important interconnection between all major rivers of central and southern India, constituting a backbone for an integrated grid system controlling water supply, irrigation, and navigation in the peninsula. (Knapp-USGS)
W73-15270

DETERMINATION OF XYLEM TENSIONS IN THE CROWN OF A GIANT SEQUOIA: SEQUOIADENDRON GIGANTEUM,
Hochschule fuer Bodenkultur, Vienna (Austria). Botanisches Institut.
For primary bibliographic entry see Field 02I.
W73-15279

PRELIMINARY DATA ON BIOLOGY AND SPECIFICITY OF ACIGONA IGNITALIS HAMPS. (LEP., PYRALIDAE) ON THE HOST PLANT EICHHORNIA CRASSIPES (MART.) SOLMS LAUBACH (PONTEDERIACEAE), (IN SPANISH),
Escuela Agricola Jackson, Montevideo (Uruguay). Dept. of Entomology.
For primary bibliographic entry see Field 05G.
W73-15286

4B. Groundwater Management

THE EFFECTS OF DIMINISHED GROUNDWATER SUPPLIES ON SELECTED NEW HAMPSHIRE INDUSTRIES,
New Hampshire Univ., Durham. Dept. of Agricultural and Food Economics.
R. H. Forste.
Available from the National Technical Information Service as PB-223 803, $9.75 in paper copy, $1.45 in microfiche. PhD Dissertation, 1973. 140 p, 17 fig, 28 tab, 57 ref. OWRR A-028-NH (1). 14-31-0001-3529.

Descriptors: *Water management (Applied), *Water utilization, *Groundwater, *Reasonable use, Competing uses, Legal aspects, Water rights, Resource allocation, Economics, Water law, *New Hampshire, Institutional constraints, Withdrawal, *Water allocation (Policy).

Increasing withdrawals of groundwater for industrial and residential uses in New Hampshire present allocation problems involving legal and economic equity. Legal issues have been based on the rule of reasonable use. To deal with groundwater allocation, the economic damages/losses resulting from diminished groundwater should be considered and estimated. The New Hampshire courts haven't had these estimates, or a methodology for determining them. The objectives of this study were to (1) estimate the costs incurred by industrial groundwater users if supply constraints are imposed; (2) outline a methodological framework to guide decisions on resource allocations; (3) assess the impact on selected industrial groundwater users in the short-run and project long-run adjustments under supply constraints. Four firms were selected for analysis. Cost struc-

ture of the firms was related to their industrial processes. The groundwater law and equity were examined. Several implications may be drawn from the findings: (1) research on the availability of groundwater supplies is necessary; (2) ownership of groundwater rests in the public and should be utilized accordingly; (3) the premise of societal ownership implies regulation and management of the resource by the State; (4) regulatory commissions and courts should have the economic implications of alternatives available when faced with a groundwater dispute. The partial budgeting simulations developed provide an example of one technique that would be feasible, useful and expeditious in this context.
W73-14766

QUANTITATIVE HYDROLOGIC STUDY OF A CLOSED BASIN WITH A PLAYA (ESTANCIA VALLEY, NEW MEXICO),
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02A.
W73-14767

GEOHYDROLOGY OF THE CROSS-FLORIDA BARGE CANAL AREA WITH SPECIAL REFERENCE TO THE OCALA VICINITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 08B.
W73-14807

SALT-WATER MOVEMENT IN THE LOWER WITHLACOOCHEE RIVER--CROSS-FLORIDA BARGE CANAL COMPLEX,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 08B.
W73-14808

GROUND-WATER CONDITIONS IN THE LOWER WITHLACOOCHEE RIVER--CROSS-FLORIDA BARGE CANAL COMPLES AREA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 08B.
W73-14809

GEOLOGIC APPRAISAL OF PARADOX BASIN SALT DEPOSITS FOR WASTE EMPLACEMENT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-14820

THE EFFECT OF SORPTION ON THE MIGRATION OF BE-7 FROM A HIGH ENERGY ACCELERATOR CONSTRUCTED ON A CHALK SITE,
Rutherford High Energy Lab., Chilton (England).
For primary bibliographic entry see Field 05B.
W73-14821

HYDROLOGY OF SEASONALLY INUNDATED AFRICAN HEADWATER SWAMPS,
National Council for Scientific Research, Lusaka (Zambia). Water Resources Unit.
For primary bibliographic entry see Field 02A.
W73-14825

UTILISATION OF DISUSED COAL MINES AS WATER STORAGE RESERVOIRS,
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil Engineering.
T. Cairney.
Journal of Hydrology, Vol 19, No 3, p 251-258, July 1973. 3 fig, 5 ref.

Descriptors: *Water storage, *Coal mines, *Underground storage, Mine water, Reservoir yield, Reservoirs, *Reservoir storage, Coal mines.
Identifiers: *England.

The potential of underground storage of water in disused coal workings is discussed. Where conditions are suitable, mine workings offer large yields at low cost. In rural areas of Britain, minewaters are often taken into the public supply. However, individual mines seldom yield more than 1 million gallons per day, since the sandstones and shales associated with coal seams are usually of low permeability. However, the water yield of an entire coalfield can be surprisingly high. The North-Eastern Coalfield in the counties of Northumberland and Durham produced some 80 million gallons per day until recent years. On economic grounds, direct pumping is usually not feasible. However, very large underground storage volumes often exist in mines and these offer a solution to the water supply-land conservation problem. (Knapp-USGS)
W73-14827

STUDY OF GROUNDWATER RESOURCES IN THE USSR (IZUCHENIYE RESURSOV PODZEMNYKH VOD SSSR),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. S. Zektser, B. I. Kudelin, and O. V. Popov.
Vodnyye Resursy, No 1, p 42-51, 1972. 1 tab, 8 ref.

Descriptors: *Groundwater resources, *Groundwater, Base flow, *Surface-groundwater relationships, Hydrographs, Hydrogeology, Aquifers, Safe yield, Water resources, Water balance, Mapping, Estimating.
Identifiers: *USSR.

Fundamental principles for a regional estimate of natural groundwater resources and safe yield are examined. Patterns of groundwater occurrence, depending on different natural factors, are determined from mapping of natural groundwater resources in the USSR, and role of groundwater and base flow in total water resources and water balance of the country is described. The ratio of groundwater to surface waters is tabulated for individual hydrogeological regions of the USSR, and basic problems in the study of groundwater resources are discussed. (Josefson-USGS)
W73-14849

WATER TABLE CONTROL WITH SUBSURFACE IRRIGATION,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-14858

EFFECTS OF SANITARY LANDFILLS ON GROUND AND SURFACE-WATER MOVEMENT AND WATER QUALITY,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-14859

WATER QUALITY AND MINERAL SOLUBILITIES IN SURFACE AND GROUND WATER; OAK OPENINGS COMMUNITY, LUCAS CO., OHIO,
Toledo Univ., Ohio. Dept. of Geology.
N. Valkenburg.
Available from the National Technical Information Service as PB-224 014, $7.25 in paper copy, $1.45 in microfiche. M. S. Thesis, 1973. 90 p. OWRR C-3082 (No. 3682) (1). OWRR 14-31-0001-3682.

Descriptors: *Water quality, *Groundwater movement, Groundwater, Surface waters, Water chemistry, *Ohio, Aquifers, Trace elements, Lead, Zinc, Cadmium, Dissolved solids, Sodium chloride, Sands, *Urban renewal, *Mineral water.
Identifiers: *Toledo (Ohio).

Oak Openings Community is a 4,587 acre County Renewal area situated on a surficial sand aquifer. Ground water samples were extracted from near the bottom of the aquifer through drive points at four sites. At five additional sites ground water samples were extracted through well screens installed across the water table. Surface water samples were collected from drainage ditches at eight sites. Samples were collected from these surface water and groundwater sites seven times between May 4, 1972, and March 9, 1973. Each sample was analyzed for calcium, magnesium, sodium, potassium, chloride, nitrate, bicarbonate, lead, zinc, cadmium, iron, specific conductance, pH, total dissolved solids, and hardness. The maximum total dissolved solids was 642 parts per million, and only iron content exceeded U. S. Public Health Service and Ohio Department of Health recommendations. All water was the calcium-bicarbonate type, and surface water was more highly mineralized than ground water. Mineral equilibria calculations using analyzed values of dissolved species suggest that both ground water and surface water are in near equilibrium with aquifer minerals except for sodium and chloride, which imply additional halite that is not known to be a natural aquifer mineral.
W73-14863

INVESTIGATION OF THE WATER TABLE IN A TIDAL BEACH, FINAL REPORT.
Virginia Inst. of Marine Sciences, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14985

APPRAISAL OF THE WATER RESOURCES OF CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. Sutcliffee, Jr.
Open-file report 73010, 1973. 61 p, 18 fig, 13 tab, 23 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Urbanization, *Florida, Water quality, Projections, Water demand, Hydrologic data, Aquifer characteristics, Water wells, Water yield, Water analysis, Chemical analysis, Water supply, Water utilization, Streamflow, Reservoirs, Agriculture, Water table aquifers, Water levels, Salinity, Desalination.
Identifiers: *Charlotte County (Fla).

The coastal area of Charlotte County, in west-central Florida, is undergoing rapid urbanization and is experiencing major problems in obtaining sufficient water of suitable quality to meet public-supply requirements. The relatively flat county is drained by two major streams, the Myakka and Peace Rivers, and many small streams and canals. Neither of the major streams is used for water supply. Although the average rainfall is 54 inches per year, the low-flow characteristics are such that little or no flow will occur in most streams for as much as 30 consecutive days on the average once every 20 years. The chemical quality of water in most of the streams and canals is suitable for use by public water supplies. However, most favorable reservoir sites are already in use. Large water supplies for Charlotte County will be obtained in the future chiefly from: (1) the water-table aquifer in the southeastern part where permeable shell beds can yield as much as 600 gpm of potable water; (2) zones that have not been contaminated by saline water; (3) desalted groundwater; and (4) water imported from outside the county. (Woodard-USGS)
W73-14996

USE OF GROUND WATER FOR IRRIGATION IN SEWARD COUNTY, NEBRASKA IN 1971,
Geological Survey, Lincoln, Nebr.
E. K. Steele, Jr.
Open-file Report 7308, August 1973. 28 p, 13 fig, 2 tab, 8 ref.

Descriptors: *Irrigation wells, *Groundwater, *Withdrawal, *Irrigation, *Nebraska, Hydrologic data, Drainage, Topography, Soils, Precipitation (Atmospheric), Pumping, Water level fluctuations, Groundwater movement, Groundwater recharge, Crop production.
Identifiers: *Seward County (Neb).

Use of groundwater for irrigation in Seward County, Nebraska, west of the Big Blue River increased tremendously from 1945 to 1971. During that period, the number of irrigation wells increased from 5 to 614. Groundwater withdrawals prior to 1971 are estimated to have reduced groundwater storage by about 270,000 acre-feet, and withdrawals during 1971 continued to reduce storage. The values for changes in storage were computed from weighted-average net differences in groundwater levels. In 1971, average pumpage from the 32 wells for which well yield and hours of pumping were recorded indicates that pumpage from all wells totaled about 83,000 acre-feet. (Woodard-USGS)
W73-14997

WATER RESOURCES OF THE DELMARVA PENINSULA, A SUMMARY REPORT TO THE CONGRESS,
Geological Survey, Parkville, Md.
E. M. Cushing, I. H. Kantrowitz, and K. R. Taylor.
House Document No 93-68, 93rd Congress, 1st Session, Message from President of United States Transmitting Summary Report on Water Resources of Delmarva Peninsula: U.S. Government Printing Office, Washington, 1973. 59 p, 43 fig, 6 tab, 3 ref.

Descriptors: *Water resources, *Delaware, *Maryland, *Virginia, Surface waters, Groundwater, Water yield, Water quality, Water utilization, Water resources development, Projections, Hydrologic data, Precipitation (Atmospheric), Streamflow, Runoff, Aquifer characteristics, Chemical analysis, Estuaries, Salinity, Data collections, Forecasting, Evaluation.
Identifiers: *Delmarva Peninsula.

The Delmarva Peninsula comprises about 6,5000 square miles on the Atlantic Coastal Plain and includes parts of Delaware, Maryland, and Virginia. The peninsula is underlain by unconsolidated (Coastal Plain) sediments that range in thickness from a featheredge at the Fall Line (the northern boundary of the peninsula) to as much as 8,000 feet along parts of the Atlantic coast. Many of the streams, including some of the smaller ones (less than 25 square miles), have flows sufficient to provide water supplies greater than 1 mgd during a low-flow period having a recurrence interval of 10 years. Streamflow is generally low in dissolved solids and chemically suitable for most uses except in the downstream reaches of those streams subject to tidal invasion of saline water. Annual use of water on the peninsula in 1970 was about 137 mgd, of which about 14 mgd was withdrawn from streams for irrigation supplies, and the remainder, 123 mgd, was withdrawn from the aquifers. About 75% of the groundwater supply was from the Quaternary aquifer and the water-table parts of the older aquifers. The amount of freshwater that can be developed perennially on the peninsula is estimated to be at least 1,5000 mgd. This amount is about six times the estimated use of water on the peninsula by the year 2010. (Woodard-USGS
W73-15000

FUNDAMENTAL PROBLEMS OF GROUNDWATER CONSERVATION (OSNOVNYYE PROBLEMY OKHRANY PODZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 05B.
W73-15009

SANITARY PROBLEMS OF THE WATER SUPPLY OF RURAL SETTLEMENTS OF THE NORTH DAGESTAN LOWLANDS AND MEASURES FOR THEIR RATIONAL USE, (IN RUSSIAN),
Dagestanskii Meditsinskii Institut, Makhachkala (USSR).
Sh. A. Aliev.
Gig Sanit. Vol 37, No 5, p 96-97. 1972.
Identifiers: Lowlands, Measurement, Rural settlements, *Sanitary problems, *USSR (N. Dagestan), *Water supply, Artesian water.

Bacteriological contamination of the underground waters of the N. Dagestan lowlands does not occur because of their great depth of occurrence (more than 200 m), presence of a thick impervious roof and remoteness from supply regions. The artesian waters are a valuable natural resource; their rational use will transform the desert appearance of the lowlands.--Copyright 1973, Biological Abstracts, Inc.
W73-15139

CALCULATION OF WATER QUALITY FROM ELECTRICAL LOGS THEORY AND PRACTICE,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02K.
W73-15193

HYDROLOGIC DATA FOR 1971, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. W. Bearden.
Geological Survey open-file report 73016, 1973. 87 p, 42 fig, 4 tab, 14 ref.

Descriptors: *Water resources, *Hydrologic aspects, *Hydrologic data, *Water quality, *Florida, Surface waters, Canals, Groundwater, Water wells, Water yield, Aquifer characteristics, Rainfall, Runoff, Groundwater recharge, Water analysis, Chemical analysis, Salinity, Hydrographs, Data collections.
Identifiers: *Broward County (Fla).

The general hydrologic conditions in Broward County for the 1971 water year are portrayed by graphically comparing long periods of record from rainfall, groundwater, surface-water, and water-quality stations with records from these stations for the 1971 water year. Water-level fluctuations were monitored in 79 wells. A continuous record of stage and discharge was obtained from 7 stream-gaging stations in canals. The record for one station in Dade County, Snake Creek Canal at S-29, is also discussed. Tidal fluctuations in the Intracoastal Waterway are recorded at 4 stations. Samples for analysis of natural constituents, metals, nutrients, pesticides, and bacteria are collected quarterly at 25 sites. Field determinations of DO, pH, temperature, specific conductance, and alkalinity are made at 4-hour intervals during a 24-hour period each quarter at the 25 sites. Samples for chloride analysis are collected monthly at salinity control structures and at selected sites in the tidal canals. Conductivity recorders are maintained in three canals near major well fields. The average annual rainfall in Broward County, based on 28 calendar years of record, is 59.10 inches. Rainfall averaged 35.86 inches during the 1971 water year. (Woodard-USGS)
W73-15266

4C. Effects on Water of Man's Non-Water Activities

VARIATION OF URBAN RUNOFF QUALITY WITH DURATION AND INTENSITY OF STORMS--PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
D. M. Wells, J. F. Anderson, R. M. Sweazy, and B. J. Claborn.
Available from the National Technical Information Service as PB-223 930, $3.75 in paper copy, $1.45 in microfiche. Project Completion Report (WRC-73-2), August 1973. 87 p, 14 fig, 33 tab, 17 ref. OWRR B-104-TEX (1). 14-31-0001-3654.

Descriptors: *Water quality, *Urban runoff, *Water analysis, *Environmental effects, *Texas, Urbanization, Storm runoff, Surface runoff, Asphalt, Concretes, Chemical analysis, Data collections, Correlation analysis, Water pollution sources, Water treatment.
Identifiers: *Lubbock (Tex).

The variation of urban runoff quality was investigated with the duration and intensity of storms. The data obtained were analyzed using stepwise linear regression to determine significant trends in how storm characteristics and antecedent conditions affect runoff quality. The project utilized a 223-acre watershed location within south-central Lubbock, Texas. Samples were analyzed for total and fecal coliform, chemical oxygen demand, biochemical oxygen demand, total residue, volatile residue, total suspended solids, volatile suspended solids, pH, alkalinity, nitrate nitrogen, and orthophosphate. All of the runoff from the basin is routed directly into the concrete channel on the west side of K. N. Clapp Park in which the Parshall flume, automatic rain gage, and sampler were located. Approximately 5.6 miles of streets and 3.1 miles of alleys carry runoff during precipitation. The streets are paved with asphaltic concrete with concrete curbs and gutters. The average concentration of BOD in urban stormwater runoff was approximately one-third the concentration expected to be found in raw domestic sewage and approximately 10 times the average concentration of the secondary effluent from Lubbock, Texas. (See also W71-01546 and W72-00816) (Woodard-USGS)
W73-14771

DEFORESTATION EFFECTS ON SOIL MOISTURE, STREAMFLOW, AND WATER BALANCE IN THE CENTRAL APPALACHIANS,
Forest Service (USDA), Upper Darby, Pa. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 04D.
W73-14919

MODEL FOR CALCULATING FLOODS IN URBANIZED WATERSHEDS,
Technische Hochschule, Brunswick (West Germany).
U. Maniak.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 429-435, 1973. 4 fig, 3 ref.

Descriptors: *Flood routing, *Urban hydrology, *Urbanization, Mathematical models, Rainfall-runoff relationships, Storm runoff, Urban runoff, Storm water.
Identifiers: *Germany.

Streamflow records in areas subject to urbanization are difficult to interpret from a statistical point of view because of short length, sparse

gages, and nonhomogeneity. For this reason it is usually necessary to study the long term hydrologic effects of urbanization by simulation using rainfall-runoff models. Modeling techniques must be used for developing optimal designs for hydraulic structures. Input data required for simulation of urban watersheds include distribution of precipitation amount, duration, and frequency as well as areal variations of rainfall. For the southern and northwestern parts of Germany, floods are often caused by storms having stripes of heavy precipitation embedded in zones of general rainfall. For modeling purposes, the watersheds are divided into subunits ranging in size from 0.5 to 3 sq km depending upon the characteristics of the watershed and the degree of urbanization. Surface roughness and surface slope are estimated for the subareas. Surface runoff and interflow are computed separately. The surface runoff is determined by deducting infiltration, depression storage, and interception from the precipitation. Interflow is estimated using an experimental parameter depending upon the soil moisture storage capacity. The surface runoff and interflow are combined and routed downstream using well known storage equations. (Knapp-USGS)
W73-15060

PREDICTIVE STUDY ON URBANIZING EFFECT OF DRAINAGE BASIN ON FLOOD RUNOFF,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
M. Kodoya.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 436-449, 1973. 8 fig, 4 ref.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Infiltration, Urbanization, Floods, Storm runoff, Urban runoff, Storm water, Peak discharge.
Identifiers: *Kinematic waves, *Japan.

A study was undertaken in Japan to develop a suitable method for predicting the effect of urbanization on flood runoff. Removing the previous ground surface layer and replacing with pavement causes the decrease of groundwater and interflow components, and pavement and channelizing of the ground surface change the roughness to accelerate and concentrate the overland flow. Three conceptual models are introduced. These are the kinematic wave model for overland flow and/or direct runoff, the interflow model for the flow in porous surface strata, and the recharge capacity model for groundwater runoff. A simple method is also given for estimating the maximum peak runoff. The method is based on the estimation of the concentration time. (Knapp-USGS)
W73-15061

THE POPULATION DYNAMICS OF CHANNEL CATFISH, ICTALURUS PUNCTATUS (RAFINESQUE), IN THE LITTLE MISSOURI ARM OF LAKE SAKAKAWEA. BEFORE AND DURING COMMERCIAL EXPLOITATION, 1968-1971,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-15261

4D. Watershed Protection

DEFORESTATION EFFECTS ON SOIL MOISTURE, STREAMFLOW, AND WATER BALANCE IN THE CENTRAL APPALACHIANS,
Forest Service (USDA), Upper Darby, Pa. Northeastern Forest Experiment Station.
J. H. Patric.
Research Paper NE-259, 1973, 12 p. 3 fig, 8 tab, 39 ref.

Descriptors: *Soil moisture, *Streamflow, *Water balance, *Precipitation (Atmospheric), *Watersheds (Divides), *Forest soils, Soil types, *Clear-cutting, Transpiration, Runoff, Storm runoff, Surface runoff, Leaves, Evaporation, United States, Mountains, Mountain forests, Seasonal, Trees, *Appalachian Mountain Region, *West Virginia.

Soil moisture, precipitation, and streamflow were measured on three watersheds in West Virginia, two deforested and one forested. Water content of barren soil always exceeded that of forest soil throughout the growing season, especially in dry weather. Streamflow increased 10 inches annually on the cleared watersheds, mostly between July and October. Higher soil moisture was accompanied by large instantaneous peak flows during small storms in the growing season. This peak effect was minor in large storms and in all storms during the dormant season. The water balance equation was solved for transpiration with sufficient sensitivity to demonstrate the effects of tree leaf growth. After leaves were fully grown, calculated evaporative losses from the forested watershed exceeded potential rates when unmeasured runoff (leakage) was disregarded. Estimated leakage seemed consistent with observed stream behavior. (Brown-IPC)
W73-14919

STREAM CHANNELIZATION (A CRITIQUE OF CEQ'S CHANNELIZATION REPORT),
Arkansas Wildlife Federation, Little Rock.
For primary bibliographic entry see Field 06E.
W73-15147

VEGETATION CHANGES AS A RESULT OF SOIL RIPPING ON THE RIO PUERCO IN NEW MEXICO,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon, and G. Garcia.
Journal of Range Management, Vol 25, No 5, p 381-383, September 1972. 2 fig, 1 tab, 6 ref.

Descriptors: *Soil management, *Surface runoff, *Forages, *Vegetation effects, Deep tillage, Infiltration, Watershed management, Erosion control, Semiarid climates, Grasslands, *New Mexico, Southwest U.S.
Identifiers: *Soil ripping, *San Luis watershed (N. Mex).

Soil ripping effectively reduces surface runoff and erosion from semiarid watersheds as well as causing a favorable shift in forage production on the San Luis watersheds. This area is the transition zone between woodland and semidesert grassland with annual precipitation close to 10 in. with average growing season precipitation (May 1-November 1) around 6 in. Investigation was conducted over a period of 15 years revealing the treatment's effectiveness for runoff and erosion control is short lived, but its effect on plants--a favorable shift in forage importance from galleta to alkaki sacaton--has continued for seven years. The trend to revert back to original relationship is indicated, the original relationship taking another 3 to 5 years to reestablish. (Bahre-Ariz.)
W73-15213

INTRODUCED ANIMAL EFFECTS AND EROSION PHENOMENA IN THE NORTHERN UREWERA FORESTS,
Olsen (P. F.) Co. Ltd., Rotorua (New Zealand).
F. P. Wallis, and I. L. James.
N Z J For. Vol 17, No 1, p 21-36. 1972. Illus.
Identifiers: Animals, Beech, Deer, *Erosion control, Forests, *New Zealand (Northern Urewera), Opossum, Rain, Soils, Storms, Streams.

The northern Urewera forests provide major indirect benefits to most of the eastern Bay of Plenty farmlands and towns through control of erosion and water runoff on the steep unstable mountain land that occupies 75% of the Whakatane and Waioeka River catchments. Recent assessments in this forest region show that there has been a depletion of deer preferred species and a depression of advance growth stockings throughout the main forest types. A decline in deer numbers, attributed mainly to recent animal control operations, appears to be effecting an improvement in beech and podocarp-hardwood forest stockings. Where opossum numbers are high, their damage to shrub hardwood forest occupying unstable sites is considered to have increased shallow depth earth movements and stream channel erosion. Major slipping in the region is associated with the high intensity rainstorms, steep slopes and soil physical properties.--Copyright 1973, Biological Abstracts, Inc
W73-15291

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

ALLEVIATION OF LAKE POLLUTION BY UTILIZATION OF AQUATIC PLANTS FOR NUTRITIONAL, MEDICINAL OR INDUSTRIAL PURPOSES,
Minnesota Univ., Minneapolis. Dept. of Pharmacognosy.
E. J. Staba.
Available from the National Technical Information Service as PB-223 963, $3.00 in paper copy, $1.45 in microfiche. Minnesota Water Resources Research Center, Minneapolis, Mimeographed Report, September 1973. 31 p, 1 tab, 7 ref. OWRR A-025-MINN (6).

Descriptors: *Aquatic plants, *Minnesota, Toxicity, Protein, Nutrients, Forage, Carbohydrates, Lakes, Lipids, Organic compounds, Coagulation, Chromatography, Gas chromatography, Inhibitions, Analytical techniques, Methodology.
Identifiers: Hemolysis test, Froth test, Methanolysis, Hydrogenation, Dragendorff positive spots, Flavonols, Tannins, Saponins.

A study was conducted with a reasonable anticipation of finding compounds such as alkaloids, flavonoids, tannins, saponins, steroids and lipids which might be useful in medicine. Examination of chemical constitutents was accomplished on the following plants collected from various lakes in Minnesota: Anacharis canadensis, Calla Polustris, Carex lacustris, Ceratophyllum demersum, Chara vulgaris, Eleocharis smallii, Lemna minor, Myriophyllum exalbescens, Nuphar variegatum, Nymphaea tuberosa, Potamogeton amplifolius, P. natans, P. pectinatus, P. richardson, P. zosteriformis, Sagittaria cuneata, S. latifolia, Sparganium eurycarpum, S. fluctuans, Typha angustifolia, Vallisneria americana, and Zizania aquetica. Thin-layer chromatographic detection studies indicated original extracts did not appear to contain alkaloids. Several plant species demonstrated Dragendorff positive spots. Flavonols were most widely distributed in the plant extracts studies. Tannins, especially the condensed type, were widely distributed in the plants screened. Five species of plants are saponin positive. Beta-sitosterol was tentatively identified as being present in 8 species. The lipid contents of 3 species may be considered for their nutritional value. The toxicity of the aquatic plants in general was found to be relatively low. (Walton-Minnesota)
W73-14764

THE IZAA SPRECTROMETER: A DETECTOR FOR TRACE ELEMENTS IN GASES, LIQUIDS, AND SOILS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 02K.
W73-14785

DETERMINATION OF TRACE QUANTITIES OF ARSENIC IN WASTEWATERS BY CARBON ROD ATOMIC ABSORPTION SPECTROMETRY,
Los Angeles County Sanitation District, Whittier, Calif. San Jose Creek Water Quality Lab.
R. B. Baird, S. Pourian, and S. M. Gabrielian.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 15, p 67-76, 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Spectrophotometry, *Flame photometry, *Arsenic compounds, Pollutant identification, Trace elements, Water analysis, Chemical analysis.
Identifiers: *Atomic absorption spectrophotometry.

A flameless atomic absorption method is given for the analysis of arsenic in wastewaters. The method employs a carbon rod atomizer. The analysis offers comparable sensitivity to the arsine methods while also demonstrating the ability to recover organic as well as inorganic arsenic from spiked wastewater samples. The absolute detection limits determined experimentally for arsenic standards and wastewaters are 40 and 44 picograms, respectively. This corresponds to a relative detection limit of about 10 micrograms per liter when an 8:1 concentration is used. The sensitivity of the method for wastewaters containing arsenic in a matrix of nitric acid is 60 picograms. (Knapp-USGS)
W73-14786

APPLIED WATER CHEMISTRY AT WASHINGTON STATE UNIVERSITY,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 09A.
W73-14787

WATER QUALITY AND MINERAL SOLUBILITIES IN SURFACE AND GROUND WATER; OAK OPENINGS COMMUNITY, LUCAS CO., OHIO,
Toledo Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 04B.
W73-14863

SEMI-CONTINUOUS CULTURE OF BACTERIA ON MEMBRANE FILTERS: I. USE FOR THE BIOASSAY OF INORGANIC AND ORGANIC NUTRIENTS IN AQUATIC ENVIRONMENTS,
Warsaw Univ. (Poland). Zaklad Microbiologica Wody Sci.
For primary bibliographic entry see Field 05B.
W73-14891

ENVIRONMENTAL MONITORING HELPS RESOLVE POLLUTION PROBLEMS,
Westinghouse Electric Corp., Raleigh, N.C. Meter Div.
J. J. Paulus.
Westinghouse Engineer, Vol 33, No 5, p 150-155, Sept. 1973. 5 fig, 2 ref.

Descriptors: *Monitoring, *Control systems, *Pollutant identification, *Instrumentation, Air pollution, Water pollution, Sensors, Computers, Data processing, On-site data collection, Data storage and retrieval, Water quality control, Dissolved oxygen, Hydrogen ion concentration, Conductivity, Turbidity, Temperature, Water levels, Flow, Water analysis.

The Adviser Environmental System (AES), described and illustrated, automatically senses, records, and transmits atmospheric and/or aqueous environmental conditions and supplies data in a form ready for computer analysis. The AES comprises sensors, sensor calibration, and support equipment, enclosures and towers, and two parallel data acquisition subsystems, viz., a Report and Historical System (RHS) and an Operational Real-Time System (ORTS). Sensor data from the RHS are collected at the monitoring site and recorded on magnetic tape cartridges which are collected monthly and transferred to computer tape, punched cards, or computer storage. The ORTS permits real-time parameters to be read on-site or from a remote location on command, either at regular preset intervals or as an alarm signal whenever a given pollutant exceeds a preset limit. Among water quality parameter sensors that can be interfaced with the AES are continuous monitors for dissolved oxygen, pH, conductivity, turbidity, temperature, water level, and flow. Future additions to the system are planned to monitor also BOD, COD, TOD (total oxygen demand), TOC (total organic carbon), nitrogen and sulfur compounds, chlorides, chlorine, phosphates, and various other ions. (Brown-IPC)
W73-14917

SPECTROPHOTOMETRIC DETERMINATION OF VANADIUM IN SEA WATER,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries.
M. Nishimura, K. Matsunaga, T. Kudo, and F. Obara.
Analytica Chimica Acta, Vol 65, No 2, p 466-468, July 1973. 1 fig, 1 tab, 10 ref.

Descriptors: *Sea water, *Water analysis, *Metals, Saline water, Water types, Photometry, Spectrophotometry, Analytical techniques, Chemical analysis, Trace elements, Foreign research, Turbidity.
Identifiers: *Vanadium, Japan.

The method described eliminates the need for preconcentration of sea water samples. It is based on the selective reaction of 4- (2-pyridylazo)resorcinol (PAR) with vanadium in the presence of 1,2-cyclohexanediamine-tetraacetic acide (CyDTA), followed by extraction with chloroform via coupling with tetradecyl-dimethyl-benzylammonium chloride (Zephiramine). Turbidity in the chloroform layer is eliminated, and more complete masking of interfering ions in sea water is achieved by adding potassium cyanide (KCN) with the CyDTA and washing the chloroform layer with NaCl solution. The sensitivity of the spectrophotometric determination was 0.025 microgram vanadium per liter for 0.001 absorbance, with a standard deviation of 8% at the 1 microgram per liter vanadium level and 3% at the 3 microgram level. (Brown-IPC)
W73-14950

A NEUTRON ACTIVATION PROCEDURE FOR THE DETERMINATION OF DISSOLVED SILVER IN SEA WATER,
Liverpool Univ. (England). Dept. of Oceanography.
K. Kawabuchi, and J. P. Riley.
Analytica Chimica Acta, Vol 65, No 2, p 271-277, July 1973. 1 tab, 1 fig, 16 ref.

Descriptors: *Sea water, *Water analysis, *Metals, *Neutron activation analysis, Saline water, Water types, Analytical techniques, Chemical analysis, Separation techniques, Radiochemical analysis, Trace elements, Ion exchange.
Identifiers: *Silver.

In the procedure described, silver (Ag) is preconcentrated by anion exchange, the concentrate is subjected to bombardment with thermal neutrons, and Ag-110m is separated from other radionuclides by a conventional radiochemical separation scheme. At a silver level of 40 ng/liter, the method gave a coefficient of variation of plus or minus 10%. (Brown-IPC)
W73-14951

THE DETERMINATION OF CHLORINATED ALIPHATIC HYDROCARBONS IN AIR, NATURAL WATERS, MARINE ORGANISMS, AND SEDIMENTS,
Liverpool Univ. (England). Dept. of Oceanography.
A. J. Murray, and J. P. Riley.
Analytica Chimica Acta, Vol 65, No 2, p 261-270, July 1973. 6 fig, 3 tab, 2 ref.

Descriptors: *Water analysis, *Pollutants, *Organic compounds, *Chlorinated hydro-carbon pesticides, Air, Natural streams, Running waters, Bodies of water, Sediments, Moluscs, Aquatic animals, Aquatic life, Chemical analysis, Halogenated pesticides, Air environments, Analytical techniques, Gas chromatography, Chromatography, *Pollutant identification.

In the described procedure for the nearly quantitative extraction and determination of chlorinated aliphatic hydrocarbons, the C1 compounds are stripped from water samples by bubbling with nitrogen, from aquatic organisms or sediments by heating in a nitrogen current, and from air samples by passage through activated carbon traps and subsequent desorption by heating in nitrogen. In either case, the halogen compounds are trapped in copper columns packed with Chromosorb coated with a silicone oil, and cooled to -78C. The columns are swept out with argon into a gas chromatographic column, and the chromatogram peaks are ascertained with an electron-capture detector. Among C1 compounds thus found in air and water samples were carbon tetrachloride, chloroform, trichloroethylene, and perchloroethylene. Their concentration in waters sampled away from industrial areas ranged from 0.5 to 18.5 ng/liter, in air samples from 2.5 to 6.5 ng/cu m. In samples from urban areas, the concentrations were one to two orders of magnitude higher. Significant amounts of these plus other unidentified C1 compounds were also observed in mollusc tissues and estuarine sediments. Minor amounts of short-chain halogen compounds, such as methyl chloride and dichlorodifluoromethane, were also detected, especially in air samples. (Brown-IPC)
W73-14952

ANALYSIS OF HIGH-PURITY WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. I. THE USE OF AN AUTOMATED SAMPLING SYSTEM,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
C. J. Pickford, and G. Rossi.
The Analyst (Journal of the Society for Analytical Chemistry), Vol 97, p 647-652, Aug 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Cooling water, Spectroscopy, *Analytical techniques, *Sampling, *Water analysis, *Trace elements, Chemical analysis, Nuclear powerplants, Powerplants, Electric powerplants, Corrosion, Water types, Automation, Cobalt, Copper, Chromium, Iron, Manganese, Nickel.
Identifiers: *Atomic absorption spectroscopy.

Corrosion studies on water-cooled nuclear power plants were hitherto hindered by lack of a sufficiently sensitive and precise method for determining trace metals in parts-per-billion amounts in high-temperature water circuits. Manual sampling and sample injection methods for graphite-tube analyses and subsequent atomic absorption spec-

trometry involved contamination hazards and other problems. An apparatus for fully automatic stream sampling and multiple aliquot sample injection is described, which permits, e.g., 10-100 microgram/liter traces of Co, Cr, Cu, Fe, Mn, and Ni to be determined with a standard deviation of 0.6 to 2.4% on 10 to 17 replicate samples. (See also W73-14956) (Brown-IPC)
W73-14955

ANALYSIS OF HIGH-PURITY WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. II. SIGNAL INTEGRATION WITH A NON-RESONANCE LINE CORRECTION SYSTEM FOR SPURIOUS ABSORPTION PHENOMENA,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
C. J. Pickford, and G. Rossi.
The Analyst (Journal of the Society for Analytical Chemistry), Vol 98, No 1166, p 329-334, May 1973. 4 fig, 1 tab, 15 ref.

Descriptors: Spectroscopy, *Analytical techniques, *Water analysis, *Trace elements, *Cooling water, Nuclear power plants, Powerplants, Electric powerplants, Corrosion, Water types, Automation, Chemical analysis, Cobalt, Copper, Chromium, Iron, Manganese, Nickel.
Identifiers: *Atomic absorption spectroscopy.

The precision of graphite-tube flameless atomic-absorption spectroscopy, particularly at low concentrations (parts-per-billion levels) of metal traces, was greatly improved by using a non-resonance line correction system and integration of the absorption signal. The precision of a system comprising a polychromator plus multichannel integrator and automatic sample injector (described in Part I) was evaluated at high and low absorbances. Its ability to compensate for spurious absorption and variable volatility effects was also examined. Some variations in signal intensity caused by changes in volatility of water samples could be eliminated. The compensation for spurious absorption phenomena was satisfactory up to 95% absorption, provided that the reference line was close to that of the main element. The system was suitable as a first approach to fully automatic simultaneous determinations of several trace elements. A more appropriate spectrophotometer and a more sophisticated exit slit assembly would improve the system's flexibility. (See also W73-14955) (Brown-IPC)
W73-14956

LABORATORY SYSTEM FOR TRITIUM ANALYSIS OF LARGE NUMBERS OF ENVIRONMENTAL SAMPLES,
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 05B.
W73-14973

PLUTONIUM IN LAKE MICHIGAN WATER,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-14977

ROLE OF ORGANIC MATERIALS IN A WATER COURSE WITH RESPECT TO RADIOACTIVE CONTAMINATION. METHOD OF EXTRACTION, FRACTIONATION AND IDENTIFICATION BY SPECTROSCOPY AND THEIR AFFINITY TO RADIONUCLIDES,
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 05B.
W73-14982

A STUDY OF THE DISTRIBUTION OF POLYCHLORINATED BIPHENYLS IN THE AQUATIC ENVIRONMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-14992

SPECIFIC CHARACTER OF THE STRUCTURE AND DYNAMICS OF RESERVOIR WATER MASSES (O SPETSIFICHNOSTI STRUKTURY I DINAMIKI VODNYKH MASS VODOKHRANILISHCH),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 02H.
W73-15008

TWENTY-FIFTH HYDROCHEMISTRY CONFERENCE (XXV GIDROKHIMICHESKOYE SOVESHCHANIYE),
For primary bibliographic entry see Field 02A.
W73-15016

UNRELIABILITY OF THE C-14 METHOD FOR ESTIMATING PRIMARY PRODUCTIVITY IN EUTROPHIC DUTCH COASTAL WATERS,
Netherlands Inst. for Sea Research, Den Helder.
W. W. C. Gieskes, and A. J. van Bennekom.
Limnology and Oceanography, Vol 18, No 3, p 494-495, May 1973. 1 tab, 10 ref.

Descriptors: *Measurement, *Primary productivity, *Radioactivity techniques, *Reliability, Silica, Photosynthesis, Estimating, Methodology, Phytoplankton, Organic compounds, Incubation.
Identifiers: *Error sources, *C-14, Enrichment, Errors, Excretion, Dissolved organic matter, Particulate organic matter, Polysaccharides.

Since large amounts of carbon assimilated during photosynthesis have been shown to be excreted by phytoplankters, it is believed that the release of C-14-tagged compounds could lead to a considerable underestimation of primary productivity using the Steemann-Nielsen (1952) C-14 technique. Using the above as a basis, primary productivity has been estimated for the particulate and dissolved organic fraction in the eutrophic Rhine River using the liquid scintillation method of Anderson and Zeutschel (1970). Other sources of error were also investigated: (1) labeled polysaccharides and other organic compounds of the gelatinous material in which phytoplankton colonies are embedded and (2) the high content of dissolved silica in C-14 ampoules which results in an overestimation. Results of preliminary experiments using seawater from the edge of the Rhine River plume show that (1) productivity may be enhanced by the level of silica enrichment taking place when the contents of normal C-14 ampoules are added to small samples; (2) overestimation will probably be minimized if short incubation periods are used; and (3) the activity of filters and filtrates should be measured when dealing with dominant phytoplankton species which secrete gelatinous sheaths. (Holoman-Battelle)
W73-15078

SAMPLING BIAS OF A LONGHURST-HARDY PLANKTON RECORDER,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 07B.
W73-15080

A MESSENGER-OPERATED CLOSING TRAWL,
University of South Florida, St. Petersburg. Marine Science Inst.
For primary bibliographic entry see Field 07B.
W73-15081

SIMPLE APPARATUS FOR CONDUCTING ACUTE TOXICITY BIOASSAYS UNDER FIELD CONDITIONS,
Department of the Environment, Winnipeg (Manitoba). Fisheries Service
M. R. Falk.
Water Research, Vol 7, No 6, p 821-822, June 1973. 1 fig.

Descriptors: *Bioassay, *Mechanical equipment, *On-site tests, *Costs.
Identifiers: *Cages.

Cages 61 X 30.5 X 30.5 cm were constructed from aluminum angle frames for use in field bioassays. Within each cage a 0.64 cm braided nylon mesh bag with an opening of 100 sq cm was suspended and attached along the top. A plastic bag 46 X 96 cm was placed in each mesh bag. The apparatus was tested by lashing six of the cages together and anchoring them in 20 cm of water. Fish from the area were placed in the bags which were lightly aerated. Results were comparable to those obtained in laboratory tests. However, the portable apparatus was much cheaper to set up and saved the cost of shipping effluents. (Little-Battelle)
W73-15084

MONITORING THE DOSE OF FLUORINE IN FLUORIDATION OF DRINKING WATER, (IN RUSSIAN),
Ya. B. Lazovskii, M. V. Bomash, and F. A. Kolobova.
Gig Sanit. Vol 37, No 5, p 95-96. 1972. Illus.
Identifiers: *Fluoridation, *Fluorine, Monitoring, *Potable water.

The dose of F in fluoridation of drinking water was monitored using the zirconium-ali-zarin colorimetric technique based on a proportional change of color intensity of a solution as a function of the F1-concentration.--Copyright 1973, Biological Abstracts, Inc.
W73-15089

ALGAE OF THE CHO-OYU (E. HIMALAYAS) EXPEDITION-II, BACILLARIOPHYCEAE-II,
Osmania Univ., Hyderabad (India). Hydrobiology Lab.
M. R. Suxena, V. Venkateswarlu, and V. Rao.
Nova Hedwigia, Vol 23, Nos 2-3, p 415-431, 1972. 41 fig, 36 ref.

Descriptors: *Chrysophyta, *Systematics, *Ecological distribution, *Aquatic habitats, *Diatoms, Aquatic algae, Speciation, Natural streams, Varieties.
Identifiers: Cyclotella stelligera, Coscinodiscus lacustris, Fragilaria spp, Eunotia spp, Achnanthes austriaca var. helvetica, Achnanthes bergiani, Achnanthes spp, *Navicula spp, Pinnularia spp, Amphora ovalis var. pediculus, Cymbella spp, Gomphonema spp, Denticula tenuis var. intermedia, Nitzschia spp.

The present communication dealing with the diatoms from high altitudes describes 51 species, out of which 30 taxa are new reports from India. The records of distribution of the taxa are given with reference to India and adjacent countries like Burma, Ceylon, Afghanistan and Tibet. For the distribution data, except for the standard works, only such papers are taken into consideration which either give detailed description of the taxa or provide an illustration. The material was collected from a valley overlooking Namchebazar, from different aquatic habitats and smaller streams flowing into Dudkosi River at altitudes ranging from 2900-4200 m. (Holoman-Battelle)
W73-15094

PHYTOPLANKTON ORGANIZATION IN BAIE DES CHALEURS (GULF OF ST LAWRENCE),
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.

For primary bibliographic entry see Field 02L.
W73-15111

LIGHT AND ELECTRON MICROSCOPE STUDIES OF DIATOM SPECIES BELONGING TO THE GENUS CHAETOCEROS EHRENBERG. I. CHAETOCEROS SEPTENTRIONALE OESTRUP,
Texas Univ., El Paso. Dept. of Biological Sciences.
E. L. Duke, J. Lewin, and B. E. F. Reimann.
Phycologia, Vol 12, Nos 1/2, p 1-9, June 1973. 19 fig, 3 tab, 31 ref.

Descriptors: *Electron microscopy, *Systematics, Diatoms, Chrysophyta.
Identifiers: *Chaetoceros septentrionale, *Ultrastructure.

The ultrastructural detail and a schematic reconstruction of the silica shell of Chaetoceros septentrionale Oestrup are presented. The material for this study was derived from cultured material from four sources in Pacific and Atlantic coastal waters. A significant finding is the participation of the valvar costae in the formation of the setae. Three types of girdle bands are described. The first girdle band is equipped with horns that project upward into the basal parts of the setae. These findings are compared with previous descriptions of Chaetoceros septentrionale and other members of the genus Chaetoceros, particularly in reference to the differentiation of girdle bands and intercalary bands. (Little-Battelle)
W73-15113

A RAPID METHOD FOR CLEARING DIATOMS FROM TAXONOMIC AND ECOLOGICAL STUDIES,
Oklahoma Univ., Willis. Biological Station.
G. A. Zoto, D. O. Dillon, and H. E. Schlichting, Jr.
Phycologia, Vol 12, Nos 1/2, p 69-70, June 1973. 10 ref.

Descriptors: *Systematics, Ecology, *Diatoms, *Methodology, *Cytological studies, Pollutant identification, Chrysophyta.
Identifiers: *Sample preparation, Rhizosolenia, Attheya, Chaetoceros, Frustules.

A new method utilizing a muffle furnace at 560 plus or minus 10C for 15 to 20 minutes to clear diatoms for taxonomic study is presented. This technique allows for exceptionally well cleared frustules for all the diatoms studied. It also allows phytosociological studies to be made of the colonization and succession of the diatoms on the exposed slides or coverslips from various aquatic habitats. This method has been used only for the moderate and heavily silicified diatom frustules, and it has not been tested for the delicate frustules of Rhizosolenia, Attheya, and Chaetoceros. (Holoman-Battelle)
W73-15115

GROWTH OF DICTYOSPHAERIUM, SELENASTRUM, AND SCENEDESMUS (CHLOROPHYCEAE) IN A DILUTE ALGAL MEDIUM,
Connecticut Univ., Storrs. Biological Sciences Group.
For primary bibliographic entry see Field 05C.
W73-15116

EFFECT OF SKF-525A ON BRAIN ACETYLCHOLINESTERASE INHIBITION BY PARATHION IN FISHES,
Mississippi State Univ., State College. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-15119

THE OCCURRENCE AND DISTRIBUTION OF SOME AQUATIC PHYCOMYCETES ON ROSS ISLAND AND THE DRY VALLEYS OF VICTORIA LAND, ANTARCTICA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-15120

AN IN SITU METHOD FOR MEASURING PRIMARY PRODUCTIVITY OF ARCTIC SEA ICE ALGAE,
Alaska Univ., College. Inst. of Marine Science.
R. C. Clasby, R. Horner, and V. Alexander.
Journal of the Fisheries Research Board of Canada, Vol 30, No 6, p 835-838, June 1973. 2 fig, 12 ref.

Descriptors: *Primary productivity, *Ice cover, *Marine algae, *On-site tests, *Methodology, On-site data collections, Light intensity, On-site investigations, Measurement, Radioactivity techniques, Scuba diving, Arctic Ocean, Testing procedures.
Identifiers: *Photosynthetic rates, C-14, Chlorophyll a.

An in situ technique has been devised for measuring the primary productivity of the ice algal community in the Arctic Ocean. A combined sampler-incubation chamber constructed of plexiglass was screwed into the underside of the ice to a depth of 2 cm by SCUBA divers. The above chamber was inoculated with C-14-bicarbonate for primary productivity experiments. In order to measure photosynthetic rates under varying light conditions, rectangular plexiglass boxes were suspended beneath the ice from ice pitons. The incubation chambers were placed in these boxes without being surfaced and the boxes were wrapped with perforated metal screening to simulate various light intensities. There was a slight increase in primary productivity rates over the range of 13-66 lux. Above 66 lux the rate increased sharply. It was also noted that productivity rates ranged from 7.67-mg C/sq m hr near the peak of the bloom to a low of 0.30-mg C/sq m hr just prior to the thaw period. (Holoman-Battelle)
W73-15122

BLUE-GREEN ALGAL FLORA OF RAJASTHAN,
Udaipur Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-15130

MICROFUNGI COLONIZING SUBMERGED STANDING CULMS OF PHRAGMITES COMMUNIS TRIN,
Nottingham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-15131

MICROFUNGI COLONIZING COLLAPSED AERIAL PARTS OF PHRAGMITES COMMUNIS TRIN. IN WATER,
Nottingham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-15132

MORPHOLOGY AND DEVELOPMENT OF A NEW ALGA, HALOPLEGMA ANWERII (CERAMIACEAE) FROM KARACHI COAST,
Karachi Univ. (Pakistan). Dept. of Botany.
M. Shameel, and M. Nizamuddin.
Nova Hedwigia, Vol 23, Nos 2-3, p 433-444, 1972. 6 fig, 6 ref.

Descriptors: *Rhodophyta, *Marine algae, *Plant morphology, *Plant growth, Speciation, Systematics.
Identifiers: *Haloplegma anwerii, Marine environment, *Persian Gulf, Karachi Coast.

A new species, Haloplegma anwerii, is described from Karachi and the Persian Gulf. The species is characterized by a constant number of cells, i.e. 6 in the mesh, and the number of cells in transverse filaments (cross beams) is 2-celled. The transverse filaments are opposite. (Holoman-Battelle)
W73-15133

AQUATIC FUNGI FROM AN ANTARCTIC ISLAND AND A TROPICAL LAKE,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W73-15134

ION SELECTIVE FLOW-THROUGH ELECTRODES: CONSTRUCTION AND PROPERTIES OF HEAVY METAL SENSORS,
State Univ. of New York, Buffalo. Dept. of Chemistry.
H. Thompson, and G. A. Rechnitz.
Chemical Instrumentation, Vol 4, No 4, p 239-253, 1973. 5 fig, 3 tab, 17 ref. EPA R-800991.

Descriptors: *Chemical analysis, *Electrodes, Ionexchange, *Copper, *Cadmium, *Lead, Fabrication, Heavy metals, *Pollutant identification, *Instrumentation.
Identifiers: Ion-selective electrodes, Flow-through electrodes.

The construction and properties of silver sulfide matrix flow-through electrodes for copper, cadmium, and lead are discussed in detail. A comparison of electrode response in the dipping and flow-through configurations is made and various aspects of pellet preparation, mounting, reference conditions, conditioning, and surface polishing are evaluated. Response times of 5 sec were obtained at flow rates of 1 to 10 ml/sec. Possible applications include automated continuous sample analysis and reaction rate studies. (Hoover-EPA)
W73-15170

TECHNIQUES FOR THE SAMPLING AND HANDLING OF ANAEROBIC MICROBES IN WASTE FERMENTATION SYSTEMS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
H. E. Hamilton, I. J. Ross, and S. W. Jackson.
Transactions of ASAE, (American Society of Agricultural Engineers) Vol 16, No 1, p 172-175, 1973, 9 fig, 4 ref.

Descriptors: Autoclaves, *Farm wastes, *Poultry, Livestock, Anaerobic conditions, *Fermentation, Analytical techniques, Dilution, Waste treatment.
Identifiers: Rumen sampling, Fermentor sampling, Test tubes, Pipetting device, Inoculation, *Microbial growth, Colony counting, Chemical changes.

An equipment and technique experiment involved the fermentation of autoclaved chicken excreta with rumen microbes obtained from a fistulated steer being fed a diet containing 23% chicken manure. The equipment pictured and described was designed and constructed for improving the efficiency of preparing test tubes for enumerating microbes in the fermented samples. This equipment successfully aided in the experiments requireing rapid handling and processing of large numbers of samples. (Frantz-East Central)
W73-15172

CORRELATING OIL AND ODOROUS COMPONENTS IN STORED DAIRY MANURE,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05B.
W73-15177

THE BACTERIOLOGICAL EXAMINATION OF WATER SUPPLIES.
Department of Health and Social Security, London (England); and Ministry of Housing and Local Government, London (England).
For primary bibliographic entry see Field 05F.
W73-15191

CALCULATION OF WATER QUALITY FROM ELECTRICAL LOGS THEORY AND PRACTICE,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02K.
W73-15193

SOME DESMIDS FROM UGANDA,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W73-15208

FIELD SPECTROMETRIC MEASUREMENTS OF RADIONUCLIDE CONCENTRATIONS AND EXTERNAL GAMMA EXPOSURE RATES AT THE NEVADA TEST SITE, A DEMONSTRATION STUDY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 05B.
W73-15238

ROLE OF THE ORGANIC MATTER OF A WATERWAY WITH REGARD TO RADIOACTIVE POLLUTION (INFLUENCE DES CONDITIONS D'EXTRACTION SUR LE FRACTIONNEMENT COMPORTEMENT DES ELEMENTS CHIMIQUES VIS-A-VIS DE LA MATIERE ORGANIQUE),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 05B.
W73-15244

A METHOD FOR THE DETERMINATION OF STRONTIUM-90 AND CESIUM-137 IN RIVER SEDIMENTS AND SOILS,
Atomic Energy of Canada Ltd. Chalk River (Ontario). Chalk River Nuclear Labs.
W. E. Grummitt, and G. Lahaie.
Available from NTIS, Springfield, Va., as AECL-4365; $4.00 in paper copy, $1.45 in microfiche. Report AECL-4365, March 1973. 14 p, 1 tab, 7 ref.

Descriptors: *Radiochemical analysis, *Soil contamination, *Fallout, *Nuclear wastes, Radioactivity techniques, Separation techniques, Analytical techniques, Soil analysis, *Strontium radioisotopes, Sediments.
Identifiers: *Cesium radioisotopes.

The sensitivity by beta counting is about 0.1 picocurie per 100 g, greater than by gamma spectroscopy, which is applicable only for Cs137. Sample preparation for counting included ashing to remove organic matter, treating with fuming hydrofluoric acid to remove silica, then alkali fusion to separate Cs from Sr, and finally radiochemical separation. Determination of Sr85 (added as tracer) and Cs137 by the alternative method of gamma spectroscopy indicated a chemical yield of 65-80% of the radioactivity. (Bopp-ORNL)
W73-15245

DATA FILE ON METAL DISTRIBUTION IN EAST AFRICAN RIFT SEDIMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W73-15262

HYDROLOGIC DATA FOR 1971, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-15266

YERSINIA ENTEROCOLITICA IN DRINKING--WATER,
Statens Institutt for Folkehelse, Oslo (Norway).
J. Lassen.
Scand J Infect Dis. Vol 4, No 2, 125-127, 1972.
Identifiers: *Yersinia-Enterocolitica, *Potable water, Cultures, *Disease vector, Serotypes.

Fifty drinking-water specimens, selected at random, were examined for Y. enterocolitica in Feb. 1970 and April 1971. Eleven cultures were isolated from 10 of these specimens which on a serological and/or biochemical basis could be classified as Y. enterocolitica. Two of these cultures were antigenically identical with previously described serotypes (serotypes 7 and 13), 7 showed antigenic relationship to serotypes previously described although they were not identical (serotypes 2,4,6 and 16) while the 2 remaining cultures represented new serotypes. The serotypes which are most frequently found in human Y. enterocolitica infections were not shown in these specimens selected at random, but it presumed that these serotypes can also be conveyed through drinking-water.--Copyright 1973, Biological Abstracts, Inc.
W73-15274

5B. Sources of Pollution

PHOSPHATE RETENTION BY LAKE SEDIMENTS,
Maine Univ., Orono. Dept. of Plant and Soil Sciences.
E. G. Lotse.
Available from the National Technical Information Service as PB-223 880, $3.50 in paper copy, $1.45 in microfiche. Maine University Land and Water Resources Center, Orono, Project Completion report, June 1973. 36 p, 28 fig, 4 tab, 49 ref. OWRR A-016-ME (1).

Descriptors: *Lake sediments, *Phosphates, *Chemical reactions, *Maine, Retention, Bottom sediments, Chemical properties, Physical properties, Hydrogen ion concentration, Phosphorus, Adsorption, Model studies, Equations, Calcium carbonate, Filters, Fluorides, Calcium compounds.
Identifiers: Phosphate retention.

Phosphate retention by sediments from Sebasticook Lake, Maine, calcium carbonate, and Ca-kaolinite could be described by the Langmuir isotherm at low phosphate concentrations. Phosphate retention by hematite and gibbsite could be described by the Freundlich isotherm. The calculated maximum surface saturation was 1600 microgram/g and 850 microgram/g for two sediment samples, 25 microgram/g for calcium carbonate, and 187 microgram/g for Ca-kaolinite. A second order kinetic equation was developed to describe the rate of phosphate adsorption by calcium carbonate and Ca-kaolinite. A two-constant rate equation was developed to describe the kinetics of phosphate adsorption by sediments, hematite, and gibbsite. The activation energy of adsorption was between 2 and 3 kcal/mole. This indicates that phosphate adsorption is a diffusion-controlled process. The desorption of phosphorus from minerals and sediments was dependent on the anionic species present in the solution. The replacing power of the anions appeared to be related to their ionic potential and complexing ability. The rate of desorption could be described by the proposed two-constant rate equation. The efficiency of phosphate removal by calcium fluoride was 99% or higher at concentrations ranging from 4 to 100 ppm P and pH values of 2.1 to 11.7. Thus, it appears that calcium fluoride can be used as a filter for phosphate removal from waste effluents (Woodard-USGS)
W73-14751

EFFECTS OF DEVELOPMENT ON SALINITY AND LIMNOLOGY OF THE LOWER COLORADO RIVER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 05C.
W73-14756

NEW FLUORESCENT TRACER DETECTION TECHNIQUES FOR USE IN POLLUTED ENVIRONMENTS,
Rhode Island Univ., Kingston. Dept. of Physics.
J. A. Northby.
Available from National Technical Information Service as PB-223 965, $2.75 in paper copy, $1.45 in microfiche. Rhode Island Water Resources Center, Kingston, Final Report, 1973. 6 p. OWRR B-039-RI (1). 14-31-0001-3643.

Descriptors: Instrumentation, *Fluorescence tracers, *Rhode Island, *Dye releases, *Path of pollutants.
Identifiers: *Polarized tracers, *Polarization, Providence River (R.I.), Narragansett Bay (R.I.).

Polarization properties are reported of the background fluorescence of natural water samples obtained from the Providence River and Narragansett Bay. These properties appear to be subject to the same spatial and temporal variability as the unpolarized background fluorescence. Consequently, it is unlikely that significant improvement in the sensitivity of detection of tracer dyes in polluted water can be achieved by using a dye whose polarization properties are complimentary to those of the background.
W73-14770

VARIATION OF URBAN RUNOFF QUALITY WITH DURATION AND INTENSITY OF STORMS--PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 04C.
W73-14771

MAPPING HYDROCARBON SEEPAGES IN WATER-COVERED REGIONS,
Shell Oil Co., New York. (assignee)
For primary bibliographic entry see Field 05G.
W73-14776

DISTRIBUTION AND LEVELS OF LEAD AND ARSENIC IN GRAND TRAVERSE BAY, LAKE MICHIGAN BOTTOM SEDIMENTS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
J. R. Marsh, and R. A. Minear.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 1, p 1-4, 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Arsenic compounds, *Bottom sediments, *Lake Michigan, *Arsenicals (Pesticides), Pesticide residues, Path of pollutants.
Identifiers: *Grand Traverse Bay (Lake Michigan).

Up to 114,000 pounds of lead arsenate pesticides are applied each year to approximately 17,000 acres of sweet and tart cherry orchards in the Grand Traverse Bay, Michigan drainage area. Sediment samples were taken from the top three inches of the sediments at 18 sampling stations throughout the bay. The background values for ar-

senic are from 0-1.0 mg of As per kg of sediment, dry weight, with an average concentration of 0.2 mg per kg. Background lead concentrations range from 2-65 mg per kg, with an average of 27.3 mg per kg. Measured arsenic concentrations ranged from 0.2-8.5 mg of As per kg sediment, dry weight, with yearly averages ranging from 2.3-3.5 mg per kg. In general, the concentrations seem to correspond to the use patterns, although the sediment type exerts considerable influence. (Knapp-USGS)
W73-14781

CHEMICAL ECOLOGY OF HYDROGEN SULFIDE PRODUCTION IN FRESHWATER LAKE SEDIMENT,
Michigan Univ., Ann Arbor. Dept. of Industrial Health.
For primary bibliographic entry see Field 02H.
W73-14782

INVESTIGATION OF HEAVY METAL-SLUDGE COMPLEXATION CONSTANTS BY CATION EXCHANGE,
Illinois Inst. of Tech., Chicago.
M. H. Cheng, J. W. Patterson, and R. A. Minear.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 3, p 14-24, 1973. 4 fig, 3 tab, 6 ref.

Descriptors: *Chelation, *Heavy metals, *Sludge, *Cation exchange, Sewage sludge, Path of pollutants, Adsorption, Organic matter.
Identifiers: Complexing (Chemical).

Determination of complexation constants of activiated sludge and process supernatant with heavy metals provides a useful tool for quantitative assessment of the interaction between metals contained in combined sewage, and organic matter of the sludge and liquid phases. Cation-exchange techniques were employed to measure stability constants of metal-supernatant and metal-sludge complexes. The affinity of the sludge for metal ions is strong, and dependent upon several factors including pH and the concentrations of organic matter and metals present in the system. The stability of complexation was assessed by adding known competing chelating agents, such as EDTA, NTA, and glycine. The complexing strength of activated sludge with the metals is relatively less than for these chelating agents. The sludge mass possesses great ability to concentrate metal ions from wastewater, with a rapid first phase of uptake occurring within three to ten minutes, followed by a long period of slower uptake. (Knapp-USGS)
W73-14783

SOME REACTIONS OF CHLORINE AND OXY--CHLORINE SPECIES WITH ORGANIC COMPOUNDS IN AQUEOUS MEDIA,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
D. H. Rosenblatt.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 51, p 186-189, 1973. 11 ref.

Descriptors: *Chlorination, *Oxidation, *Disinfection, *Waste water treatment, Chlorine, Water treatment, Aqueous solutions.
Identifiers: *Chlorine dioxide, Chlorites.

Chlorine, along with bromine and iodine, reacts reversibly with water. The oxidizing power of the parent element is preserved in a number of ionic and molecular species. In addition to these species, two others derivable from chlorine through a relatively easy and practical series of reactions are chlorite ion and chlorine dioxide. The nature of all reactant species present in a solution, as well as their absolute and relative concentrations, must be considered to predict the behavior of chlorine and reactive oxygen-chlorine compounds with organic substances. (Knapp-USGS)
W73-14799

THE CHEMISTRY OF AQUEOUS NITROGEN TRICHLORIDE,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
J. L. S. Saguinsin, and J. C. Morris.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 52, p 190-191, 1973.

Descriptors: *Chlorine, *Chlorination, Chemical reactions, *Water treatment, Waste water treatment, Water chemistry, Potable water, Swimming pools, Aqueous solutions.
Identifiers: *Chloramines.

The formation of NC13 during water chlorination is of particular interest due to the nuisance character of this chlorine compound. Even when present at very low concentrations, it contributes undesirable taste and odor to drinking water and irritates the mucous membranes when present in swimming and bathing waters. Rate constants were obtained as a function of pH and temperature. Overall reaction orders as well as those for each reactant were obtained. Activation energies were derived from changes in values of the rate constant with temperature. The specific formation of NC13 is a very slow reaction, much slower than the formation of NH2Cl and NHC12. The reaction is not strongly pH dependent in the acid range studies. (Knapp-USGS)
W73-14800

KINETICS OF TRIBROMAMINE DECOMPOSITION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05F.
W73-14801

GEOLOGIC APPRAISAL OF PARADOX BASIN SALT DEPOSITS FOR WASTE EMPLACEMENT,
Geological Survey, Denver, Colo.
R. J. Hite, and S. W. Lohman.
Open-file report (USGS-4339-6), 1973. 75 p, 16 fig, 2 tab, 30 ref. USAEC Agreement AT (40-1)-4339.

Descriptors: *Waste disposal wells, *Injection wells, *Nuclear wastes, *Utah, *Colorado, Data collections, Geological surveys, Geologic formations, Geomorphology, Groundwater movement, Sedimentology, Underground waste disposal.
Identifiers: *Paradox basin (Utah and Colo), *Salt deposits.

This report is one of a series summarizing available geologic and hydrologic knowledge of certain salt deposits to help determine their suitability for waste emplacement. Thick salt deposits of Middle Pennsylvanian age are present in an area of 12,000 square miles in the Paradox basin of southeast Utah and southwest Colorado. The presence of thick cap rock over many of the salt anticlines is evidence of removal of large volumes of halite by groundwater. This is a relatively slow process and any waste-storage of disposal sites in these structures should remain dry for hundreds of thousands of years. Oil and gas in trace to commercial quantities occur in all of the black shale, dolomite, and anhydrite beds of the Paradox Member. These hydrocarbons constitute a definite hazard in the construction and operation of underground waste-storage or disposal facilities. However, many individual halite beds are of sufficient thickness that a protective seal of halite can be left between the openings and the gassy beds. A total of 12 different localities were considered to be potential waste-storage of disposal sites in the Paradox basin. Two of these sites, Shafer dome and Salt Valley anticline were considered to have the most favorable characteristics. (Woodard-USGS)
W73-14820

THE EFFECT OF SORPTION ON THE MIGRATION OF BE-7 FROM A HIGH ENERGY ACCELERATOR CONSTRUCTED ON A CHALK SITE,
Rutherford High Energy Lab., Chilton (England).
G. B. Stapleton, and R. H. Thomas.
Water Research, Vol 7, No 9, p 1259-1268, September 1973. 4 fig, 3 tab, 18 ref.

Descriptors: *Sorption, *Radioisotopes, *Path of pollutants, *Groundwater movement, *Beryllium, Radioactive wastes, Leaching, Limestones, Permeability, Water chemistry.

The radioactive nuclides produced in rock surrounding a high energy accelerator installation may migrate from the accelerator environs if subjected to the hydraulic gradients of groundwater. Under such conditions it might be possible for groundwater systems to become contaminated by long-lived radionuclides. In the migration of Be-7, an important radionuclide produced in accelerator shields, through ground predominantly composed of chalk, sorption is dominant in minimizing leach rates. In equilibrium studies, solutions of beryllium were shaken with weighed amounts of chalk powder and the equilibrium concentration on the chalk with respect to water was determined. Experiments were also performed in which water was continuously passed through long columns of chalk to elute a band of beryllium placed at the top of the chalk column. The values of sorption obtained in both the static and dynamic experiments indicate that Be-7 would move through chalk at a velocity many orders of magnitude slower than the groundwater. It would take 650 years for Be-7 to move a distance less than 1 m through the rock. Because the radioactive half life of Be-7 is only 53.4 days, the rate of migration is so slow that radioactive decay will reduce the original activity of negligible levels. (Knapp-USGS)
W73-14821

OXYGEN UPTAKE OF BOTTOM SEDIMENTS STUDIED IN SITU AND IN THE LABORATORY,
Uppsala Univ. (Sweden). Inst. of Limnology.
N. Edberg, and B. V. Hofsten.
Water Research, Vol 7, No 9, p 1285-1294, September 1973. 5 fig, 3 tab, 23 ref.

Descriptors: *Oxygen demand, *Bottom sediments, *Organic matter, Oxidation, On-site tests, Laboratory tests, Instrumentation, Biodegradation, Biochemical oxygen demand, Brackish water.

Oxygen uptake by soft bottom sediments was measured in situ with an oxygen electrode in a bell jar. Values in the range of 0.3-3.0 grams of oxygen per sq m per day were obtained at 19 localities in freshwater and brackish water. Comparative measurements were made in the laboratory on sediment cores. These gave consistently lower values than the in situ measurements. Laboratory experiments showed that the oxygen uptake depended on the oxygen concentration and that the temperature coefficient decreased with increasing temperature. There was no simple correlation between oxygen uptake and content of organic matter in sediments. (Knapp-USGS)
W73-14822

SOIL BACTERIA IN LAND-DRAINAGE WATER,
West of Scotland Agricultural Coll. Auchincruive (Scotland). Dept. of Microbiology.
M. R. Evans, and J. D. Owens.
Water Research, Vol 7, No 9, p 1295-1300, September 1973. 2 fig, 1 tab, 8 ref.

Descriptors: *Drainage, *Soil bacteria, Runoff, *Return flow, *Drainage water, Washouts, Discharge frequcney, Monitoring, *Subsurface drainage.

The rate of discharge and the concentration of viable soil bacteria in the water from a subsurface field drain were monitored for 4 months during winter. The concentration of bacteria in the water was related to the flow of the discharge. The total number of viable bacteria in the drainage water discharged during the 4 months represented approximately 0.1% of an estimate of the total number of viable bacteria present in the soil of the experimental plot. The numbers of bacteria lost from soil by washout in drainage water were an insignificant fraction of the probable annual production of bacteria in the soil. (Knapp-USGS)
W73-14823

COMPARISON OF RADIOACTIVE GLASSES OF SCANDIUM AND IRIDIUM AS TRACERS IN SEDIMENT-TRANSPORT STUDIES,
Bhabha Atomic Research Center, Bombay (India). Isotope Div.
For primary bibliographic entry see Field 02J.
W73-14826

UTILISATION OF DISUSED COAL MINES AS WATER STORAGE RESERVOIRS,
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W73-14827

MIXING PROCESSES IN WIDE OPEN CHENNELS,
State Inst. of Hydrology and Meteorology, Warsaw (Poland).
W. Czernuszenko.
Journal of Hydrology, Vol 19, No 3, p 259-268, July 1973. 4 fig, 1 tab, 10 ref.

Descriptors: *Mixing, *Diffusion, *Open channel flow, Turbulent flow, Mathematical models, Hydraulic models, *Path of pollutants, Dispersion, Dye dispersion, Channels.
Identifiers: Channel walls.

Two cases of stream diffusion were analyzed under conditions of turbulent flow in an open channel. The cases were: (1) a source of pollution placed in the channel axis, and (2) the source at the wall. The flume was wide enough so that the cloud of dye injected near the axis did not reach the area near the wall in the studied section. The mixing process was described by a well-known equation for turbulent diffusion. The measured diffusion coefficient increases with the distance from the source. The mathematical model is entirely compatible with the results obtained from model research. Greater discrepancies between the model and the computed values occur, however, in case of a rectangular source placed at the channel wall. This is due to more complex flow conditions near the channel wall. (Knapp-USGS)
W73-14828

EXPERIMENTS IN TRACING UNDERGROUND WATERS IN LIMESTONES,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02F.
W73-14830

TURBULENT ENTRAINMENT IN BUOYANT JETS AND PLUMES,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
E. J. List, and J. Imberger.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 9992, p 1461-1474, September 1973. 1 tab, 24 ref, append. NSF Grant GK-35774X.

Descriptors: *Mixing, *Jets, *Diffusion, *Path of pollutants, *Entrainment, Turbulent flow, Turbulence, Convection, Density, Outlets, Outfall sewers.
Identifiers: Submerged flow, *Plumes.

The behavior of turbulent buoyant jets in uniform density environments is governed by an entrainment function and buoyance function, both of which are functions of the local jet densimetric Froude number and the local jet spreading angle. For plumes, Batchelor's analysis was used to show that the local Froude number and jet angle are constant. These two facts were then used to show that the buoyancy and entrainment functions in plumes are also constant and that their values can be deduced from an experimental velocity profile alone. Experimental results were used to show that the jet (an axisymmetric buoyant jet) is virtually independent of elevation and this result leads to the conclusion that the entrainment function is linearly dependent on the inverse of the local jet Froude number. The buoyancy function is constant, with the value 1.16 for axisymmetric buoyant jets. (Knapp-USGS)
W73-14841

MINIMUM LENGTH OF SALT INTRUSION IN ESTUARIES,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-14842

EVALUATIONS OF STREAM POLLUTION AND TRACE SUBSTANCES IN THE NEW LEAD BELT OF MISSOURI,
Missouri Univ., Rolla.
B. G. Wixson, and E. Bolter.
In: Trace Substances in Environmental Health-V, D.D. Hemphill, Editor, University of Missouri, Columbia, p 143-152, 1972. 2 fig, 2 tab, 12 ref. OWRR A-023-MO (2).

Descriptors: Streams, *Mine water, *Lead, *Zinc, *Lagoons, Water pollution, *Waste water treatment, Mining, Trace elements, Discharges (Water), Effluents, Environmental effects, Data collection, Evaluation, Water treatment, Heavy metals, Algae, Benthic organisms, *Missouri.

In stream pollution studies carried out in the 'New Lead Belt' of S.E. Missouri, data were collected to evaluate the effects of trace substances in wastes of lead-zinc mining operations, the charcter of individual wastes, and the effectiveness of stabilization lagoons in treating discharges. Samples from mine discharge water, combined mine-mill effluent, lagoon system effluent and streams below the mine lagoons were taken and compared with control site samples from unpolluted streams. Biological, chemical and physical parameters were evaluated along with trace metal determinations of lead, zinc and copper. Mining wastewater contains carbon dioxide and sufficient phosphorous to combine with nitrogen present in stream water and cause undesirable benthic growths in bacterial-algal mats. Recommendations include recycling of milling waste water and separate treatment of mine discharge water; treatment of tailings waste water and baffled or submerged discharge outlets; and final treatment lagoons to remove colloidal material, trace substances and metals by biological treatment. (Jerome-Vanderbilt)
W73-14857

EFFECTS OF SANITARY LANDFILLS ON GROUND AND SURFACE-WATER MOVEMENT AND WATER QUALITY,
Indiana Univ., Bloomington. Dept. of Geology.
R. V. Ruhe.
Available from the National Technical Information Service as PB-223 871, $3.00 in paper copy, $1.45 in microfiche. Indiana Water Resources Research Center (West Lafayette) Completion Report, September 1, 1972. 11 p, 7 fig. OWRR B-034-IND (1). 14-31-0001-3584.

Descriptors: *Landfills, *Path of pollutants, *Indiana, Sampling, Water quality, Water pollution control, Garbage dumps, Water pollution sources.

Two sanitary landfill areas in Indiana were instrumented and data were collected. The Monroe County Landfill is located along Anderson Road almost 7.7 miles northeast of Bloomington, Indiana on the north valley slope of Beanblossom Creek. Groundwater is sampled in monitoring wells, and surface water is sampled at selected weir sites. The Columbus Indiana Landfill is located at the base of a terrace scarp in the White River Valley. A series of double-level dikes were constructed to contain the fill. Monitoring wells were installed on the terrace, in the fill proper, and around the margin of the fill. (Knapp-USGS)
W73-14859

EFFECTS OF THERMAL DISCHARGES UPON THE CHENA RIVER,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W73-14864

AN INVESTIGATION OF SELECTED PHYSICAL AND CHEMICAL CHARACTERISTICS OF TWO SUBARCTIC STREAMS,
Alaska Univ., College. Inst. of Water Resources.
L. A. Peterson.
Available from the National Technical Information Service as PB-224 047, $12.00 in paper copy, $1.45 in microfiche. M.S. Thesis May 1973. 185 p, 32 tab, 15 fig, 58 ref, 4 append. OWRR B-017-ALAS (4).

Descriptors: *Alaska, Streams, Chemical properties, Physical properties, Water temperature, *Water quality, Alkalinity, Conductivity, Solids, Dissolved oxygen, *Nutrients, Turbidity, Subarctic, Hydrogen ion concentration.
Identifiers: *Goldstream Creek (Alas), *Chatanika River (Alas).

The objectives were to delineate baseline physical and chemical characteristics of the Chatanika River and Goldstream Creek, ascertain the source of nutrients in the streams from breakup to freezeup, delineate any significant local variation within each stream and compare the physical and chemical characteristics between the streams. The concentrations of the selected physical and chemical parameters were generally low in both streams, remaining within expected levels of unpolluted fresh water streams in the Chatanika River. Five parameters exceeded expected levels of unpolluted fresh water streams at two or more sample sites on Goldstream Creek. The concentrations of nutrients in both streams were generally quite low from breakup to freezeup; there were no important single point sources of nutrients in the Chatanika River or Goldstream Creek. The Chatanika River did not exhibit any significant local variation in water quality in the study area. Two tributaries of Goldstream Creek and one area within Goldstream Creek exhibited significant local variation in water quality, which was caused by groundwater inflow of different quality at the three locations. The major differences in water quality between the Chatanika River and Goldstream Creek are due to topography and soil types, which cause surface and groundwater movement through Goldstream Valley to be slower than through the Chatanika River valley, resulting in

ifferent quality surface and groundwaters enter- g these streams. The quality of the water in the natanika River is such that it would be an ac- ptable source for domestic and most industrial ters, and would be able to assimilate some ste without undue degradation of the water ality. Goldstream Creek should not be con- lered as a source for water or for waste assimila- n due to low flow and poor water quality during nter.
73-14867

STUDY OF TOXICITY AND BIOSTIMULA- ON IN SAN FRANCISCO BAY-DELTA ATERS, VOLUME I, SUMMARY REPORT,
alifornia State Dept. of Water Resources, Sacra- ento.
or primary bibliographic entry see Field 05C.
73-14876

STUDY OF TOXICITY AND BIOSTIMULA- ION IN SAN FRANCISCO BAY-DELTA 'ATERS, VOLUME VI, BIOASSAYS OF OWER TROPHIC LEVELS,
alifornia Univ., Berkeley. Sanitary Engineering esearch Lab.; and California Univ., Berkeley. chool of Public Health.
or primary bibliographic entry see Field 05C.
73-14879

STUDY OF TOXICITY AND BIOSTIMULA- ION IN SAN FRANCISCO BAY-DELTA VATERS, VOLUME VIII, ALGAL ASSAYS OF ELECTED WASTE DISCHARGES,
'alifornia State Dept. of Water Resources, Sacra- ento.
'or primary bibliographic entry see Field 05C.
W73-14881

'HE DETECTION OF A BOUND FERREDOXIN N THE PHOTOSYNTHETIC LAMELLAE OF BLUE-GREEN ALGAE AND OTHER OXYGEN EVOLVING PHOTOSYNTHETIC ORGANISMS,
King's Coll., London (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-14882

SEMI-CONTINUOUS CULTURE OF BACTERIA ON MEMBRANE FILTERS: I. USE FOR THE BIOASSAY OF INORGANIC AND ORGANIC NUTRIENTS IN AQUATIC ENVIRONMENTS,
Warsaw Univ. (Poland). Zaklad Microbiologica Wody Sci.
W. Kunicka-Goldfinger, and W. Kunicki-Goldfinger.
Acta Microbiol Pol Ser B Microbiol Appl. Vol 4, No 2, p 49-60, 1972, Illus.
Identifiers: *Aquatic bacteria, *Bioassay, Cultures, Environment, Filters, Growth, Inorganic nutrients, *Membrane filters, Monods, *Nutrients, Organic nutrients.

An apparatus for quasi-continuous growth of bacteria on membrane filters is described. The suitability of the device for bioassay of the major nutrients (C, N and P) in water and for the study of the effects of trace amounts of pollutants was examined. The results were calculated on the basis of Monod's formula and Lineweaver-Burke transformation, and values of maximum growth rates and saturation constants were obtained. The highest sensitivity of the proposed method was reached for a carbon source concentration of 0.1 mg of C/liter, nitrogen source 0.0013 mg of N/liter, phosphorus source (as PO3/4) 0.0006 mg/liter.--Copyright 1973, Biological Abstracts, Inc.
W73-14891

PHOSPHORUS FLUX ACROSS A CORAL REEF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
M. E. Q. Pilson, and S. B. Betzer.
Ecology, Vol 54, No 3, p 581-588, 1973. 5 fig, 5 tab, 28 ref.

Descriptors: *Productivity, *Phosphorus, *Adsorption, *Marine algae, Photosynthesis, Metabolism, Reefs, Oxygen, Respiration, Balance of nature.
Identifiers: *Coral reef, Muti Island (Eniwetok Atoll).

Measurements of phosphorus concentration in seawater before and after the water had passed over the shallow windward coral reef flat north of Muti Island (Eniwetok Atoll) are reported. One transect was close to that previously studied by Odum and Odum; another a few kilometers away. Simultaneously with the sampling at the reef front, collections were made at the lagoon end of the transect. Samples were taken from just under the surface and from about 10-20 cm above the bottom. Current and depth measurements were converted to values for the volume transport across 1 meter of reef front. The phosphorus concentrations did not vary in proportion to the photosysnthesis and respiration activities of the reef community. There were no detectable changes in either reactive or organic phosphorus between upstream and downstream ends of a transect across a relatively rich coral region, but on a transect across a predominantly algal-covered area there was a slight decrease in reactive phosphorus and slight increase in organic phosphorus. There were no detectable diurnal variations. This remarkable constancy suggests that the plants take up phosphorus at a nearly constant rate. (Jones-Wisconsin)
W73-14892

ATMOSPHERIC REAERATION IN NATURAL STREAMS,
Nebraska Natural Resources Commission, Lincoln. Data Bank.
M. K. Bansal.
Water Research, Vol 7, p. 769-782, 1973. 7 fig, 5 tab, 26 ref.

Descriptors: *Reaeration, *Self-purification, *Streams, *Mathematical studies, Dispersion, Hydraulics, Equations, Reynolds number, Path of pollutants.
Identifiers: *Atmospheric oxygenation, *Reaeration coefficient.

The dispersion of a pollutant in a stream by the fluid turbulence and nonuniformity of velocity distribution of the flow and the capacity of a stream to reaerate itself are the two key factors which affect the quality of stream water. The reaeration phenomenon in a natural stream is analogous to the dispersion mechanism, as both of these characteristics are related to the Reynolds number. The vertical dispersion parameter or the longitudinal dispersion parameter are found to be linearly related to the reaeration parameter on a log-log plot. The applicability of the relationship thus evolved is independent of regional location and takes into account both the physical and flow characteristics of the stream. An attempt is made to define a better empirical relationship of the reaeration coefficient; first with the flow characteristics and later with the dispersion characteristics of the stream. The results make possible the determination of the reaeration coefficient for a river from the known dispersion characteristics. (Auen-Wisconsin)
W73-14896

A NUMERICAL MODEL OF ESTUARINE POLLUTANT TRANSPORT,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Fischer.
In: Proceedings of the 13th Coastal Engineering Conference, July 10-14, 1972, Vancouver, B.C., p 2265-2271 (1972). 8 ref.

Descriptors: *Mathematical models, *Estuaries, *Path of pollutants, Movement, Dredging, Velocity, Dispersion, *Australia, Dimensions, Time.
Identifiers: *Botany Bay (Australia).

A two-dimensional, non-time averaged model, is computatively fast, seems to be reasonably accurate, and can be used to predict the effect of permanent changes wherever a two-dimensional representation is satisfactory. The two-dimensional models discussed average only over the vertical dimension, so that the velocity and concentration are considered to be functions of the two horizontal dimensions and time, but not of the vertical dimension. An attempt is made to simulate the physical processes of transport and dispersion of constituents in estuaries. The time step used is long, permitting simulation of a long period of real time. Accuracy can probably be improved by shortening the time step and increasing the degree to which the details of convective transport are modeled. The model is presently being applied to several real estuaries with the hope that further development will provide a useful tool for water quality studies. (Jones-Wisconsin)
W73-14900

THE ECOLOGY OF THE SOUTHERN CALIFORNIA BIGHT: IMPLICATIONS FOR WATER QUALITY MANAGEMENT.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 05C.
W73-14914

KRAFT MULTISTAGE BLEACH PLANT EFFLUENTS,
Institute of Paper Chemistry, Appleton, Wis.
G. A. Nicholls.
Tappi, Vol 56, No 3, p 114-119, March 1973. 2 fig, 3 tab, 40 ref.

Descriptors: *Bleaching wastes, *Pulp wastes, *Waste water treatment, *Water pollution treatment, *Pollution abatement, Industrial wastes, Pulp and paper industry, Recycling, Water conservation, Costs, Oxygen, Toxicity, Biochemical oxygen demand, Closed conduits, Water reuse, Oxidation, Chlorination, Chlorine, Effluents, Reverse osmosis, Chlorides, Engineering, Color.
Identifiers: Oxygen pulping, Oxygen bleaching, Spent pulping liquors, Process technology, Pulping.

The volume, concentration, chloride content, toxicity, BOD, and color of kraft mill multistage bleach plant effluents are discussed with respect to the development of closed-process technologies. 'Out-plant' bleaching effluent treatments are discussed, and their significant addition to production costs is illustrated. Among alternative 'in-plant' treatments, recent developments comprise reductions in bleach effluent volume, two engineering approaches to oxygen bleaching, the recirculation of bleach effluent in the pulp mill system, and oxidative pulping-bleaching. The volume of bleaching effluents is much greater than that of spent pulping liquors, but might be halved if water input for low-consistency (low-density) chlorination could be eliminated. With oxygen bleach, closed-process technology for semibleached kraft pulp is on the horizon, and effluents from multistage bleaching sequences are significantly reduced in pollution character. If bleach plant effluents are to be recycled, their volume must be reduced, perhaps by reverse osmosis concentration, and their chloride content must be eliminated. Oxidative wood delignification is another future possibility for closed-process combined pulping-bleaching. (Brown-IPC)
W73-14922

MERCURY IN THE GREENLAND ICE SHEET: FURTHER DATA,
Naval Research Lab., Washington, D.C.

R. A. Carr, and P. E. Wilkniss.
Science, Vol 181, No 4102, p 843-844, Aug 31, 1973. 1 tab, 6 ref.

Descriptors: *Ice cover, *Arctic, *Mercury, Glaciers, *Water pollution sources, Distribution, Pollutants, Ice.
Identifiers: *Greenland.

Newly collected data support the contention that the mercury content of Greenland glacial ices has not increased dramatically in recent years, but is distributed heterogeneously through the ice sheet. (Brown-IPC)
W73-14925

ORIGIN OF TOXIC MATERIALS IN THE KRAFT PULPING PROCESS,
British Columbia Research Council, Vancouver.
A. Bruynesteyn, C. C. Walden, and D. A. Hill.
Pulp and Paper Magazine of Canada, Vol 73, No 11, p 97-101 (Technical Paper T347), Nov. 1972. 8 fig, 8 tab, 13 ref.

Descriptors: *Toxicity, *Pulp wastes, *Bleaching wastes, *Evaporators, *Water pollution sources, *Pollutant identification, Pulp and paper industry, Foaming, Industrial wastes, Liquid wastes, Waste water (Pollution), Pollutants, Water pollution.
Identifiers: Kraft mills, Kraft pulping, *White water, Paper machines, Condensates, *Black liquor, Spent liquors, Seasonal variations.

Toxicities of effluents from bleached kraft pulp mills have been noted by many investigators to vary greatly with time. Causes of these variations were studied with unbleached white water (paper machine effluent) and its components. Results indicated that evaporator condensate was the major toxic constituent, followed by residual black liquor (spent cooking liquor). Seasonal variations in toxicity could be correlated with variations in evaporator foaming which, in turn, was responsible for much of the toxicity transfer. (Brown-IPC)
W73-14931

SOME FACETS OF THE IMPACT OF PULP MILL EFFLUENT ON THE ALBERNI INLET,
Fisheries Research Board of Canada, Nanaimo (British Columbia).
R. R. Parker, D. H. Heller, C. R. Horwood, and J. G. Sanderson.
Pulp and Paper Magazine of Canada, Vol 73, No 10, p 89-99 (Technical Paper T289), Oct. 1972. 16 fig, 1 tab, 20 ref.

Descriptors: *Pulp wastes, Waste water (Pollution), *Effluents, *Dissolved oxygen, *Water pollution effects, *Oceanography, Pulp and paper industry, Wastes, Model studies, Mathematical models, Mathematical studies, Light, Fish, Salmonoids, *Canada, Liquid wastes, Water pollution sources, Pacific coast region, Aquatic life, Aquatic animals, Industrial wastes, Discharge (Water), Monitoring.
Identifiers: *Albernie Inlet (B.C.), Vancouver Island, British Columbia, Halocline, Sunlight.

The waters of Alberni Inlet, on the west coast of Vancouver Island, about 80 miles northwest of Victoria, have been monitored for distribution of pulp mill effluent, various oceanographic factors, and dissolved oxygen (D.O.) concentrations over a range of varying conditions, including periods before and after construction of the pulp mill. Effluent distributions were shown to be in accord with the oceanographic studies and with the predictions on the basis of which the mill had been originally designed. An attempt to relate the D.O. supply and demand in a mathematical model was only partly successful. While the mill is operating, the D.O. is reduced in the stratum immediately at the bottom of and below the halocline, compared to premill conditions. However, the fact that this stratum is virtually free of mill effluent precludes direct contamination. Rather, the oxygen depletion is attributable to reduced penetration of sunlight, owing to the presence of effluent in the upper zone of the Inlet. The vitality of salmonoid fish populations did not seem to have been impaired by the pulp mill operation. (Brown-IPC)
W73-14932

MERCURY CONCENTRATIONS IN DATED VARVED MARINE SEDIMENTS COLLECTED OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, J. N. Johnson, A. Soutar, and J. D. Isaacs.
Nature, Vol 244, No 5414, p 273-275, Aug. 3, 1973. 1 fig, 11 ref.

Descriptors: *Sediments, *Mercury, Oceans, Cores, Sampling, Age, Dating, Metals, Neutron activation analysis, Atomic absorption spectrometry, Toxins, Trace elements, Marine geology, Industrial wastes, Pollutants, Pacific Coast Region, Stratification, History, Mining, Water pollution sources, *California.
Identifiers: *Santa Barbara basin (Calif).

Core samples from differently aged strata, up to 1500 years old, were gathered in the anoxic Santa Barbara Basin, about 100 miles northwest of Los Angeles, and analyzed for mercury by two different techniques which gave substantially agreeing results. A distinct increase in mercury level toward the surface layers was observed. The baseline value for the 19th century was 0.06 plus or minus 0.01 mg/dry kg. The layers deposited since 1950 contained about twice this amount of mercury. The increase is attributed to human mining and industrial activities, in agreement with findings by other investigators who analyzed dated glacial samples from Greenland. (Brown-IPC)
W73-14937

BALANCE AND CHARACTERISTICS OF EFFLUENTS FROM RECYCLING OF RESIDUAL FERMENTATION LIQUOR (BALANS I KHARAKTERISTIKA STOCHNYKH VOD PRI VOZVRATE POSLEDROZHZHEVOI BRAZHKI NA GIDROLIZ),
For primary bibliographic entry see Field 05D.
W73-14942

REMOVAL OF DYES FROM WASTE WATERS (UDALENIE KRASITELEI IZ STOCHNYKH VOD),
Tsentralnyi Nauchno-Issledovatelskii Institut Bumagi, Moscow (USSR).
For primary bibliographic entry see Field 05D.
W73-14948

IAEA RESEARCH CONTRACTS, THIRTEENTH ANNUAL REPORT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 05G.
W73-14960

ECOLOGICAL IMPLICATIONS OF FALLOUT RADIOACTIVITY ACCUMULATED BY ESTUARINE FISHES AND MOLLUSKS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, D. A. Wolfe, and D. E. Hoss.
Available from NTIS, Springfield, Va., as COO-2003-9; $4.00 in paper copy, $1.45 in microfiche. Report COO-2003-9, 1972. 40 p, 3 fig, 7 tab, 32 ref.

Descriptors: *Zinc radioisotopes, *Fallout, *Estuarine environment, *Marine animals, Absorption, Path of pollutants, Physicochemical properties, Molluscs, Marine fish, Gamma rays, Food chains, Nuclear wastes.
Identifiers: Manganese radioisotopes, Cerium radioisotopes, Ruthenium radioisotopes, Cesium radioisotopes.

Gamma-emitting radionuclides in estuarine organisms from near Beaufort, North Carolina, were measured using a 10-x-10-cm NaI (Tl) crystal and 0.5-to-2.5-kg samples. Fish samples were taken from commercial catches and were retained 2 years before measuring. Relatively high concentrations were: Cs137 in nektonic feeding fish; Mn54 in benthic feeding fish; Zn65 in oysters; Mn54 in bay scallops, and Ce144 and Ru106 in clams, mussels, and oysters. Of the 18 fish species studied, 5 were not measured since their radionuclide concentrations were relatively low. The differences in uptake between the different species are accounted for by differences in chemical composition, metabolism, and life cycle. The data show that knowledge of the physicochemical form of a radionuclide is required to predict its uptake. (Bopp-ORNL)
W73-14961

BIOKINETICS OF ENVIRONMENTAL TRITIUM,
National Environmental Research Center, Las Vegas, Nev.
A. A. Moghissi, R. G. Patzer, and M. W. Carter.
In: Tritium, p 314-322, May 1973. 3 fig, 24 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Tritium, *Environment, *Radioactivity, Effluents, Nuclear powerplants, Radioactive wastes, Air pollution, Water pollution, Water pollution sources, Fallout, Soil contamination, Food chains, Biological communities, Public health, Water vapor, Absorption, Transfer, Movement.
Identifiers: Inhalation.

The proposed rule is that under steady-state conditions the ratio between different hydrogen isotopes in various components of biological systems is essentially constant. Further studies are needed to test the validity of this proposed rule. Until confirmed, a basic prerequisite to general use of this proposed rule is that the radiation dose to the public is sufficiently small so that an averaging process can be used for environmental tritium. The underlying concept for this rule is not new as the EPA and its predecessor organizations have used this assumption for dose estimates related to environmental tritium. The appropriate equation is as follows: $H \pm 0.1\ QC$, where H is the dose equivalent in mrem/a, Q the quality factor, and C the tritium concentration in body water in pCi/ml. (Houser-ORNL)
W73-14962

STUDIES ON THE FOOD CHAIN CONTAMINATION BY TRITIUM,
Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).
R. Kirchmann, G. Koch, V. Adam, Van Den, and J. Hoek.
In: Tritium, p 341-348, May 1973. 2 fig, 7 tab, 3 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Tritium, *Radioactivity, *Water vapor, *Environment, *Effluents, Fallout, Research and Development, Food chains, Path of pollutants, Grasslands, Grazing, Milk, Ecology, Transfer, Movement, Public health.

Beyond its numerous industrial and scientific applications, tritium draws attention because it is produced in large amounts by the expanding nuclear industry and the major part is released into the environment as tritiated water. In this form, it will move freely in the biosphere, and it may be ingested by man not only in his drinking water but also in his food. Indeed, where tritiated water is

taken up by plants, incorporation of tritium into organic matter will occur during the photosynthetic process. Ingestion of this tritiated material by animals may lead to tritium content higher than expected in organic molecules which are synthesized by an animal. In order to obtain more information on this subject, several experiments have been carried out since 1968 at the experimental farm of the Center of Nuclear Studies in Mol, with financial support by the Public Health Ministry. Some recent results from data of these experiments are presented. (Houser-ORNL)
W73-14963

BEHAVIOR OF TRITIUM IN FISH FOLLOWING CHRONIC EXPOSURE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 05C.
W73-14964

TRITIUM IN THE ATMOSPHERE AND OCEAN,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
H. G. Ostlund.
In: Tritium, p 382-391, May 1973. 7 fig, 28 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Tritium, *Effluents, *Nuclear powerplants, *Assay, *Measurement, Air pollution, Water pollution sources, Soil contamination, Radioactivity, Solar radiation, Nuclear explosions, Fallout, Equilibrium, Water vapor, Sampling.
Identifiers: *Fuel reprocessing, *Cosmic rays.

Tritium was, and is being, produced by natural processes in the atmosphere from the interaction between components of the cosmic ray flux and the nuclei of the atoms of the atmosphere. Before the time of nuclear bomb tests, the total amount of tritium on earth was an equilibrium quantity, in that its global decay rate and global production rate were equal. This equilibrium quantity is now difficult to establish; not enough sampling was performed before the testing of fusion bombs in the atmosphere in the late 1950s and early 60s. However, from a few samples from pre-bomb times, and from estimates of cosmic ray flux and its interactions, it can be estimated that this equilibrium quantity must have been a few kg, possibly up to 8 kg, of tritium. Due to its short half-life, 12 years, only the atmosphere and surface waters may have had measurable tritium concentrations. Between 1954 and 1963 hydrogen bomb testing in the atmosphere released approximately 400 kg of tritium, most of which was injected into the stratosphere. (Houser-ORNL)
W73-14965

ENVIRONMENTAL TRITIUM,
National Environmental Research Center, Las Vegas, Nev.
A. A. Moghissi, and M. W. Carter.
In: Tritium, p 399-405, May 1973. 28 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Tritium, *Air pollution, *Water pollution effects, *Soil contamination, *Water pollution sources, Nuclear powerplants, Industrial plants, Radioactivity, Nuclear explosions, Water vapor, Equilibrium, Prediction, Measurement, Assay, Surveys, Monitoring, Surveying instruments, Analytical techniques, Public health.

The Environmental Protection Agency (EPA) and its predecessor organizations have long recognized the importance of tritium in the environment; the research and monitoring efforts in this field have become extensive. Tritium is intimately involved in all biological processes, and since it is also radioactive, the possibility of hazard to humans is present. Tritium in the environment originates from natural and man-made sources. In nature, tritium is produced by the interaction of cosmic rays and components of the atmosphere, while the man-made sources are nuclear reactions involved in either weapons development or peaceful uses. Tritium is a fission product as well as a product of fusion reactions and can be produced by many neutron activation processes. The contribution from power reactors, fuel reprocessing plants, and other nuclear reaction sources is gradually increasing with time. In view of this predicted increase in the environmental tritium concentration, an adequate and efficient surveillance program is desirable. The analytical techniques used in such a program must be economical, rapid and sensitive. Thus, with the initiation of environmental tritium surveillance, the development of methodology was given a high priority. (Houser-ORNL)
W73-14966

THE DOSE TO MAN VIA FOOD-CHAIN TRANSFER RESULTING FROM EXPOSURE TO TRITIATED WATER VAPOR,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 05C.
W73-14967

GUIDANCE FOR LIMITING ENVIRONMENTAL RELEASES OF TRITIUM,
Oak Ridge National Lab., Tenn.
P. S. Rohwer, M. J. Kelley, and R. S. Booth.
In: Tritium, p 422-430, May 1973. 1 fig, 1 tab, 5 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Tritium, *Assay, *Measurement, Toxicity, *Public health, Mathematical models, *Radioactivity, Air pollution effects, Food chains, Water pollution effects, Water pollution sources, Soil contamination.

Release of tritium to the environment may result in radiation doses to man. This may occur through a number of exposure modes, each mode having subordinate exposure pathways of potential importance. An exposure 'mode' is defined as the manner of exposure, e.g., ingestion, and is differentiated from an exposure 'pathway' which is the route of exposure, e.g., pasture-cow-milk-man. Exposure modes of principal importance following an environmental release of tritium are ingestion, inhalation, and immersion in contaminated air. To adequately assess the dose commitment from such a release, the potential contribution from each of these exposure modes must be considered. Dose commitment is considered in the assessment of the long-term effects of the release. Dose commitment is the total dose that an individual will accrue within his lifetime as a result of a given radionuclide intake. The Cumulative Exposure Index (CUEX) concept is being developed to facilitate realistic assessment of the effect of environmental releases of radionuclides. (Houser-ORNL)
W73-14968

TRANSFER OF TRITIUM FROM METHANE TO VEGETATION,
National Environmental Research Center, Las Vegas, Nev.
B. J. Mason, H. W. Hop, and C. L. Miller.
In: Tritium, p 455-461, May 1973. 3 fig, 2 tab, 2 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Methane, *Nuclear explosions, *Radioactivity, *Tritium, *Path of pollutant, Air pollution, Water pollution, Soil contamination, Absorption, Water vapor, Hydrogen, Aqueous solutions, Equilibrium, Vegetation, Environmental effects, Natural gas, Secondary recovery (Oil), Food chains, Public health.
Identifiers: *Secondary recovery (Gas).

The detonation of the nuclear explosive during the USAEC's Project Gasbuggy opened the way for utilizing nuclear detonations to develop heretofore inaccessible natural gas resources. Results of analyses of the gas taken from the Gasbuggy cavity indicate that tritium is one of the primary radioactive constituents of the natural gas. A study was designed to obtain information on the transfer of tritium from methane, the primary constituent of the gas, to vegetation. Testing of the production of the Gasbuggy well was done by flaring (burning) the gas for extended periods of time. The primary radioactive byproduct of this operation is tritiated water. In order to provide additional information, a set of treatments similar to those of the methane study was used to give an indication of the transfer of tritium from tritiated water vapor to vegetation. (Houser-ORNL)
W73-14969

THE BEHAVIOR OF TRITIUM IN THE SOIL,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
G. L. Stewart.
In: Tritium, p 462-470, May 1973. 1 fig, 1 tab, 14 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: Behavior, *Tritium, *Hydrogen, Radioactivity, Environment, Nuclear energy, Nuclear explosions, Nuclear powerplants, Effluents, *Soil contamination, Water pollution, Water pollution sources, Radioactive tracers, Soils, Groundwater movement, Soil aspects, Path of pollutant, Food chains, Public health.

Soil, hydrologists and other scientists are interested in predicting the rate of water movement through porous media; and, for many kinds of investigations, this can most adequately be accomplished by the use of tracer techniques. Some water tracers are classified as potentially hazardous pollutants and are, therefore, of special interest. Tritium, a radioactive isotope of hydrogen, is being used extensively as a tracer to depict water flow in porous media; and, because it is a product of thermonuclear reactions, it is sometimes considered a pollutant to the environment. Although many investigations have been conducted to determine the behavior and fate of tritium in the environment, there is still a lack of knowledge about its behavior in some natural processes, such as its interaction with soil materials. It is not only important to understand the fate of tritium in natural processes, but it is also important to fully understand its potential as a scientific tool. Listed are reasons for concern about the behavior and interaction of tritium in soils. (Houser-ORNL)
W73-14970

FORCED EXCHANGE OF TRITIATED WATER WITH CLAYS,
New Mexico Inst. of Mining and Technology, Socorro.
D. D. Rabinowitz, C. R. Holmes, and G. W. Gross.
In: Tritium, p 471-485. May 1973. 5 fig, 4 tab, 20 ref. Messenger Graphics, Phoenix, Arizona, Price: $35.00.

Descriptors: *Tritium, *Effluents, *Nuclear powerplants, *Water vapor, *Soil contamination, Absorption, Soil aspects, Soil water, Ion exchange, Soil physics, Radioisotopes, Soil environment, Waste disposal, Food chains, Public health, Environmental effects.

When tritiated water comes in contact with earth materials, some of the tritium atoms may be retained preferentially (with respect to protium) on the minerals, especially on clays. Several mechanisms of retention are known to occur, or at least are theoretically possible. Some of these are: exchange of tritium ions for hydrogen ions in exchange positions, exchange of tritium ions for exchangeable cations other than hydrogen ions,

tritiated water molecules exchanged for ordinary water of crystallization or hydroxyl water, and replacement of lattice aluminum sites by tritium (the aluminum ions moving into exchange positions). Depending on the process factors (such as mineral species present, pH, ionic exchange capacity, isotope concentration, etc.), one or the other of these mechanisms may predominate. This exchange may cause a transient retardation of the isotope's flow through the soil. If the interaction of soil and isotope is very strong, a more or less permanent fixation of the sorbed isotope may take place. (Houser-ORNL)
W73-14971

DYNAMIC MODEL OF WATER MOVEMENT IN SOIL UNDER VARIOUS CLIMATOLOGICAL CONDITIONS,
Puerto Rico Univ., Mayaguez. Dept. of Nuclear Engineering.
D. S. Sasscer, C. F. Jordan, and J. R. Kline.
In: Tritium, p 485-495, May 1973. 7 fig, 7 ref. Messenger Graphics, Phoenix, Arizona, Price: $35.00.

Descriptors: *Tritium, *Movement, Hydrology, *Model studies, *Ecosystems, *Soil water movement, Soil contamination, Kinetics, Latitudinal studies, Vertical migration, Theoretical analysis, Simulation analysis.

The purpose was to ascertain if a previously developed kinetic equation ecosystem model was sufficiently general to simulate and predict the movement of water (both stable and tritiated) in soil under diverse climatological conditions and, if so, to apply this model to water movement in the soil of a tropical rain forest, an Illinois grassland and a Nevada desert site. The model is called MESA (Multivariable EcoSystem Analysis). The water in the soil is described in the model by 50 simultaneous first order, linear differential equations with discontinuous, variable coefficients. The coefficients are assumed to be functions of the evapotranspiration, soil-water diffusion, gravity flow of soil water, and the previous 48 hours history of rainfall. Soil water had been found in earlier studies to move downward in a pulse due to gravity flow (after a rainfall), to spread out due to diffusion, and to leave the system by evapotranspiration. It was an additional purpose to determine the significance of these parameters as a function of climatic variables. (Houser-ORNL)
W73-14972

LABORATORY SYSTEM FOR TRITIUM ANALYSIS OF LARGE NUMBERS OF ENVIRONMENTAL SAMPLES,
National Environmental Research Center, Las Vegas, Nev.
D. D. Moden, J. W. Mullins, and R. E. Jaquish.
In: Tritium p 512-516. May 1973. 2 fig, 2 ref. Messenger Graphics, Phoenix Arizona, Price: $35.00.

Descriptors: *Tritium, *Analytical techniques, *Sampling, *Assay, Atmosphere, Moisture, Milk, Urine, Vegetation, Soil analysis, Animal metabolism, Natural gas, Data collections, Instrumentation, Measurement, *Pollutant identification.

The Natural Environmental Research Center, Las Vegas, performs tritium analysis on a variety of environmental samples. The laboratory surveillance activities result in the collection and analysis of samples of surface water, atmospheric moisture, milk, urine, vegetation, soil, blood, animal tissue, and natural gas. Techniques were developed for sample preparation and analysis of large numbers of samples. These techniques can be performed routinely by laboratory technicians. Quality control and calibration techniques were incorporated with the counting procedures to assure accuracy and precision of the data. Computer programs were written to perform calculations and generate necessary reports. (Houser-ORNL)
W73-14973

MAN AND THE ENVIRONMENT, A BIBLIOGRAPHY OF SELECTED PUBLICATIONS OF THE UNITED NATIONS SYSTEM, 1946-1971.
United Nations, New York.
For primary bibliographic entry see Field 05C
W73-14974

TUMBLEWEED AND CHEATGRASS UPTAKE OF TRANSURANIUM ELEMENTS APPLIED TO SOIL AS ORGANIC ACID COMPLEXES,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
K. R. Price.
Available from NTIS, Springfield, Va., as BNWL-1755; $4 in paper copy, $1.45 in microfiche. Report BNWL-1755, May 1973. 13 p, 2 tab, 6 ref

Descriptors: *Absorption, *Nuclear wastes, *Grasses, *Soil contamination effects, Chelation, Soil chemical properties, Soil-water-plant relationships, Washington, *Path of pollutants, Food chains, Organic acids, Waste disposal, Waste treatment, Environmental effects, Biological properties, Physicochemical properties.
Identifiers: *Transuranium elements.

To obtain information relevant to waste management, uptake by plants was compared for addition of transuranics to soil in nitric acid solution and in solutions containing complexing agents such as are used in nuclear-fuel reprocessing (oxalate, citrate, glycolate, or acetate). In all cases the order of decreasing uptake of the transuranics was: Np, Cm/Am, and Pu. The amount of uptake from soil spiked by solutions containing complexing agents relative to that from soil spiked by nitric acid solutions was greater for Np and Pu but less for Am and Cm. (Citrate enhanced Pu uptake 6-fold, but reduced Am uptake 10-fold.) Whether soil or plant mechanisms, or both, are responsible, and effects from varying the pH of the solutions, will be studied in the future. (Bopp-ORNL)
W73-14975

TRITIUM UPTAKE AND LOSS IN GRASS VEGETATION WHEN EXPOSED TO AN ATMOSPHERIC SOURCE OF TRITIATED WATER,
Argonne National Lab., Ill.
J. R. Kline, and M. L. Stewart.
Report available from NTIS, Springfield, Va., as ANL-7960, Part 3; $7.60 in printed copy, $1.45 in microfiche. In: Report ANL-7960, Part 3, p 117-133. Jan.-Dec. 1972. 4 fig, 1 tab.

Descriptors: *Tritium, *Nuclear wastes, *Grasses, Plant physiology, Soil-water-plant relationships, Water vapor, Air pollution, *Path of pollutants, Public health, Fallout, Milk, Pastures, Soil contamination, Soil moisture, Forecasting.

Rates of equilibration of plants with tritiated water vapor were measured under conditions chosen to simulate vegetative contamination from releases of gaseous effluents near the ground. Forecasting of vegetation contamination from effluents is simplified by the finding that the data follow first-order reaction kinetics. Most uptake occurred through the stomata of the leaves, but some occurred through the epidermis of the entire plant. The time required for equilibration with an atmospheric source indicates that milk contamination may be avoided by shifting cattle to an alternate food after a release of short duration. A few hours is required on a sunny day; much longer under rainy, overcast, or cool weather conditions. Under conditions of chronic contamination, tritium in pasture plants increases with increasing soil moisture. (Bopp-ORNL)
W73-14976

PLUTONIUM IN LAKE MICHIGAN WATER,
Argonne National Lab., Ill.
M. A. Wahlgren, and D. M. Nelson.
Report available from NTIS, Springfield, Va., as ANL-7960, Part 3, $7.60 in paper copy, $1.45 in microfiche. In Report ANL-7960, Part 3, p 7-14 Jan.-Dec. 1972. 6 tab, 19 ref

Descriptors: *Lake Michigan, *Fallout, *Nuclear wastes, *Strontium radioisotopes, *Path of pollutants, Sampling, Tritium, Water analysis, Analytical techniques, Radio-ecology, Sedimentation rates, Radioactivity techniques, Mass spectrometry
Identifiers: *Plutonium, Cesium radioisotopes

Comparison of recent and 1971 analyses suggests that plutonium distribution in lacustrine and marine environments is controlled by biological sedimentation or some other mechanism. Data on the Sr90 concentration in 1972 samples are being obtained in order to estimate its inventory in the lake. Data showing that significant concentration gradients do not exist for either Pu239 or Cs137 show that variations (if they are found) in sediment and biota will be significant in correlating other factors such as sedimentation rates or feeding habits. A CaF2 scavenging technique using 50-liter samples was used in determining Pu, Cs137, and Sr90 in lake water. A different (isotope dilution, mass spectrometer) method is being developed for plutonium for which 10- to 100-ml samples are adequate. (Bopp-ORNL)
W73-14977

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF ENRICO FERMI ATOMIC POWER PLANT - UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50341-40. $7.60 per copy, $1.45 microfiche. Docket No. 50341-40; July 1972. 201 p, 12 fig, 20 tab, 48 ref, 11 append.

Descriptors: *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Michigan.
Identifiers: *Boiling water reactors, *Environmental impact statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of the Enrico Fermi Atomic Power Plant Unit 2. The proposed plant is a boiling-water reactor located near Monroe, Michigan, cooled by wet, natural draft cooling towers and with make-up water from Lake Erie. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded that a construction permit should be issued for this plant subject to the following conditions for protection of the environment: (1) mitigate or alleviate adverse environmental effects from quarrying and construction of transmission lines; (2) establish preoperational base-line data on aquatic species; (3) establish preoperational effluent monitoring programs and a program continuing through operation; (4) establish radiological monitoring to determine effects on the environment; (5) provide a course of action to alleviate detrimental effects. (Houser-ORNL)
W73-14979

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF DUANE ARNOLD ENERGY CENTER.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50331-87. $10.60 per copy, $1.45 in microfiche. Docket No. 50331-87, March 1973. 333 p, 33 fig, 59 tab, 130 ref, 10 append.

Descriptors: *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Iowa.
Identifiers: *Boiling water reactors, *Cedar River (Iowa), *Environmental Impact Statements.

The final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed continuation of construction of the Duane Arnold Energy Center, a boiling water reactor cooled by a closed-cycle system using forced-draft cooling towers and located at Fayette Township, Iowa. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded to continue the construction permit and issue an operating license subject to some restrictions of chlorine concentrations and effects, iodine releases, and certain radiological and environmentalmonitoring programs to be continued as specified. (Houser-ORNL)
W73-14980

ECOLOGICAL INVESTIGATION OF RADIOACTIVE MATERIALS IN WASTE DISCHARGE AREAS AT LOS ALAMOS FOR THE PERIOD JULY 1, 1972 - MARCH 31, 1973,
Los Alamos Scientific Lab., N. Mex.
T. E. Hakonson, J. W. Nyhan, L. J. Johnson, and K. Y. Bostick.
Available from NTIS, Springfield, Va., as LA-5282-MS; $4 in paper copy; $1.45 in microfiche. Report LA-5282-MS, May 1973. 47 p, 17 fig, 17 tab, 56 ref.

Descriptors: *Nuclear wastes, *New Mexico, Effluents, *Semiarid climates, Terrestrial habitats, Insects, Food webs, Path of pollutants, Tritium, Nuclear explosions, *Waste disposal, Ecosystem, Vegetation, Rodents.
Identifiers: *Cesium radioisotopes, *Plutonium.

Liquid-waste-disposal-area history is summarized, including accumulative Pu. Most biota (vegetation, rodents, deer, coyotes, and two species of birds) had tritium less than the effluent water; however, honeybees from certain hives had as much as two orders of magnitude higher levels, apparently from the foraging of the bees on clover growing near disposal pits of high-tritium wastes. There was also evidence of uptake of Cs137 and Pu by biota in an area within about 2500 meters of the waste outfalls; however, most Cs137 remained in stream channel alluvium. The role of effluent pH in mediating Cs137 and Pu transport will be studied. Physical and breeding characteristics of 110 rodent species are summarized. Radionuclides are being determined in soils and biota in the vicinity of the 1945 Trinity shot near Alamagordo, New Mexico. (Bopp-ORNL)
W73-14981

ROLE OF ORGANIC MATERIALS IN A WATER COURSE WITH RESPECT TO RADIOACTIVE CONTAMINATION. METHOD OF EXTRACTION, FRACTIONATION AND IDENTIFICATION BY SPECTROSCOPY AND THEIR AFFINITY TO RADIONUCLIDES,
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
J. Faure.
Available from NTIS Springfield, Va., as ANL-Trans-943; $4 in paper copy, $1.45 in microfiche. Report ANL-TRANS-943, May 1973. 51 ref. (Trans. from CEA-R-4335 Report, August 1972).

Descriptors: *Sediments, Rivers, *Organic soils, *Nuclear wastes, Absorption, *Path of pollutants, Physicochemical properties, Separation techniques, Analytical techniques, Chemical degradation, Oxidation, *organic matter, Humic acids, Organic compounds, Chelation, Spectrophotometry, Molecular structure, Soil contamination, Soil chemical properties, Soil analysis, Trace elements.
Identifiers: *France (Rhone River).

Organic substances that absorb radionuclides in Rhone River sediments were characterized as carbonyl-containing derivatives of polycylic hydrocarbons and porphyrins. The organic matter was separated from sediment by extraction with 0.1 N NaOH or with ion-exchange resin. (In later work described in CEA-R-4443, March 1973, it was shown that the use of 0.01 NaOH produced less degradation.) Organic compounds were separated by gel-filtration chromatography and thin-layer chromatography and were identified by ultraviolet spectroscopy. The 19 figures and 9 tables of the original document are not included in this translation. (Bopp-ORNL)
W73-14982

INDIRECT RADIOACTIVE CONTAMINATION OF THE FOOD CHAIN. DETERMINATION OF THE FACTORS OF TRANSFER, SOIL/AGRICULTURAL PRODUCE, SOIL/MILK, IN THE EUROPEAN COMMUNITY,
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
J. Lehr.
Available from NTIS, Springfield, Va., as EUR 4901e; $4 in paper copy, $1.45 in microfiche. Report EUR 4901e, 1972. 42 p, 5 fig, 13 tab, 6 ref.

Descriptors: *Strontium radioisotopes, *Fallout, *Crops, *Food chains, Milk, Vegetable crops, Fruit crops, Forages, Cereal crops, Absorption, Path of pollutants, Soil contamination, Soil properties, Soil-water-plant relationships, Potassium, Europe, Soil moisture, Soil contamination effects.
Identifiers: *Cesium radioisotopes.

Data on the 1966-1967 Sr90 content of various crops are correlated. To reduce the dependence on the Ca content of the soil, a parameter termed the O.R. (ratio of Sr90 to Ca in produce)/ (ratio of Sr90 to Ca in soil) is used. Uptake was higher by rye which is cultivated on acid soils, than by other grains, and was higher by potatoes than by carrots and beets. Data are also given for fodder crops, milk, lettuce, cabbage, tomatoes, and apples. Poor correspondence with laboratory experiments showed that other factors were important in addition to those studied. Possible reasons are given for the O.R. being about twofold greater for calcareous than for other soils. Cs137 uptake from direct deposition on the plant generally is more important, but uptake through the soil is increased under the combined conditions of a humic sandy soil, deficiency in K, and a wet climate. Cs137 in fodder crops was highest in spring and appeared to correlate with soil moisture. (Bopp-ORNL)
W73-14984

A STUDY OF THE DISTRIBUTION OF POLYCHLORINATED BIPHENYLS IN THE AQUATIC ENVIRONMENT,
Geological Survey, Washington, D.C.
H. J. Crump-Wiesner, H. R. Feltz, and M. L. Yates.
Journal available from Sup Doc, GPO, Washington, D.C. 20402 Price $2.75. Journal of Research of the U.S. Geological Survey, Vol 1, No 5, p 603-607, September-October 1973. 2 fig, 4 tab, 12 ref.

Descriptors: *Polychlorinated biphenyls, *Water pollution sources, Pollutant identification, Pollutants, Surface waters, *Industrial wastes, Data collections, Pesticide residues.

Data gathered from monitoring activities and project studies show the occurrence and distribution of polychlorinated biphenyls in the aquatic environment. Residues were detected in samples from 19 States, representing nearly every region of the country. Concentrations ranged from 0.1 to 4.0 micrograms per liter in unfiltered water samples and 5.0 to 3,200 micrograms per kg in bottom sediments. PCB residues were also found in fish and aquatic plants. Samples were prepared by the same techniques used for general chlorinated insecticide detection, with special attential to cleanup and separation of PCB's from other compounds. Basic identification and quantification were made by dual-column electron-capture gas chromatography and confirmed by gas chromatography-mass spectrometry whenever possible. (Knapp-USGS)
W73-14992

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 02H.
W73-14993

CONTAMINATION OF WATER BODIES AND BIOLOGICAL ASSESSMENT OF WATER QUALITY (ZAGRYAZNENIYE VODOYEMOV I BIOLOGICHESKAYA OTSENKA KACHESTVA VOD),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W73-15007

FUNDAMENTAL PROBLEMS OF GROUNDWATER CONSERVATION (OSNOVNYYE PROBLEMY OKHRANY PODZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
Ye. L. Minkin.
Vodnyye Resursy, No 2, p 64-82, 1972. 2 fig, 2 tab, 9 ref.

Descriptors: *Groundwater, *Water conservation, *Water pollution control, *Water quality control, Water pollution sources, Pollutant identification, *Path of pollutants, Groundwater mining, Withdrawal, Exploitation, Safe yield, Aquifers, Wells, Forecasting, Equations.
Identifiers: USSR.

Two basic directions in the conservation of groundwater are examined: (1) protection of groundwater from depletion; and (2) protection of groundwater from bacterial and chemical contamination. Recommendations are developed for needed studies and forecast computations to justify groundwater conservation. Basic measures are outlined to prevent groundwater depletion and contamination and to eliminate or localize existing pollution. Depending on specific conditions, measures to eliminate or localize pollution are classified into 3 categories: (1) creation of barriers to the path of movement of contaminated water toward wells; (2) reduction in well discharge; and (3) elimination of sources of pollution and pathways by which pollutants enter groundwater.

Elimination of the pollution sources in groundwater involves great expenditure of time and labor. (Josefson-USGS)
W73-15009

PROBLEMS IN THE STUDY AND REGULATION OF ANTHROPOGENIC EUTROPHICATION OF WATER BODIES IN THE USSR (ZADACHI IZUCHENIYA I REGULIROVANIYA ANTROPOGENNOGO YEVTROFIROVANIYA VODOYEMOV V SSR),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 05C.
W73-15012

THE ACCUMULATION OF ARSENIC FROM ARSENIC-RICH NATURAL WATERS BY AQUATIC PLANTS,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Applied Biochemistry Div.
For primary bibliographic entry see Field 05C.
W73-15019

UPTAKE OF SELENIUM BY AQUATIC ORGANISMS,
Elainlasketieteellinen Korkeakoulu, Helsinki (Finland). Dept. of Medicine.
M. Sandholm, H. E. Oksanen, and L. Pesonen.
Limnology and Oceanography, Vol 18, No 3, p 496-499, May 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Absorption, *Aquatic life, *Path of pollutants, Aquatic plants, Freshwater fish, Phytoplankton, Aquatic algae, Aquatic animals, Chemical analysis, Radioactivity techniques, Zooplankton, Inhibitors, Metabolism, Marine fish, Marine algae, Food chains, Marine animals, Methodology, Perches, Crustaceans, Kelps, Pondweeds, Mammals, Herrings.
Identifiers: *Bioaccumulation, *Selenium, Selenite, Selenomethionine, Fate of pollutants, Animal tissues, Se-85, Punti, Scenedesmus dimorphus, Daphnia pulex, Reed grass, Roach, Northern pike, Cod (Fish), Burbot, Flounder, Whales, Seals (Animals) Rosefish, Starry flounder, Whitefish, Ocean perch, Breams, Pollack, Coalfish.

Fish muscle samples, plankton, aquatic plants, and meat meals were analyzed for the presence of selenium. The method of Lindberg (1968) was used in which 2,3-diaminonaphthaline is used as a fluorescing reagent and the recovery of Se is measured using Se-75 as a tracer. Cultured Scenedesmus dimorphus were used to study the transfer of Se from selenite and selenomethionine from water to phytoplankton. In some cases metabolic inhibitors (iodoacetamide, l-methionine, KCN, l-ethionine, 2,4-dinitrophenol) were used. The transfer of Se from selenite and selenomethionine to fishes was studied in aquaria. Phytoplankton which had taken up Se-75 were fed to zooplankton and finally the fish Puntius arulius. The Se content was lowest in aquatic plants, varying from 0.02 to 0.14 ppm (dry wt). Plankton samples contained from 1.1 to 2.4 ppm, fishes cultured in ponds 0.5 to 0.9 ppm, and fishes from natural environments 1.0 to 2.9 ppm. The phytoplankter, Scenedesmus dimorphus, actively concentrated Se-selenomethionine, but neither actively nor passively concentrated inorganic selenite. The zooplankton, consisting mostly of Daphnia pulex, absorbed Se from selenite. In aquariums fish concentrated only a small amount of organic or inorganic Se directly from water, but did concentrate Se from food. (Holoman-Battelle)
W73-15079

THE LIGHT DEPENDENCE OF NITRATE REDUCTASE IN MARINE PHYTOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
T. T. Packard.
Limnology and Oceanography, Vol 18, No 3, p 466-469, May 1973. 1 fig, 2 tab, 16 ref.

Descriptors: *Bioassay, *Phytoplankton, *Light intensity, *Limiting factors, Enzymes, Nitrates, Phosphates, Silicates, Nutrients, Sea water, Marine plants.
Identifiers: *Nitrate reductase, Africa (Mauritanean sector).

Experiments were designed to determine the light dependence of nitrate reductase (NR) in natural marine phytoplankton populations. The studies were conducted in the Mauritanean sector of the NW African upwelling system during March - April 1970. Seawater rich in both phytoplankton and inorganic macronutrients (NO3 (minus), PO4 (3 minus), and Si04 (4 minus)) was collected before dawn with a large volume nontoxic sampler and transferred to 4-liter Pyrex bottles. Each bottle was covered by a nickel screen designed to simulate the in situ light intensity at the depths to which 100, 50, 25, 10, and 1 percent of the surface light penetrated. A dark bottle provided a control. The bottles were incubated at sea-surface temperature (17 C) and natural sunlight until noon. The samples were then analyzed for NR activity. The light dependence of assimilatory nitrate reductase in marine photoplankton was shown to follow a rectangular hyperbola. Analysis by the Michaelis-Menten equation yielded values of K sub Lt ranging from 0.002 to 0.037 langleys per min. indicating that the light requirements of phytoplankton are satisfied at low light intensities. (Little-Battelle)
W73-15082

NITRATE REDUCTASE ACTIVITY DURING A DINOFLAGELLATE BLOOM,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-15083

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
For primary bibliographic entry see Field 05C.
W73-15086

IN VITRO HYDROLOYSIS OF POLYOXYETHYLENE ESTERS BY TISSUES OF THE AMERICAN EEL AND ATLANTIC SALMON,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. J. Wildish, and D. Beatty.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 4, p 212-217, April 1973. 3 tab, 1 fig, 5 ref.

Descriptors: *Atlantic salmon, *Toxicity, *Hydrolysis, Water pollution effects, Marine fish, Enzymes, Biodegradation, Volumetric analysis.
Identifiers: *Oil dispersants, *Polyoxyethylene esters, *Detocification, Biological samples, Tissue, *American eel, Polyoxyethylene ethers, Pegosperse 200 ML, Pegosperse L-9, Hallco CPH-43, Kessco TM, Varionic Polyglycol esters 400 MO, Ethosperse LA-4, Sample preparation, Liver, Blood, Esterase.

Tissue samples from parr and post-smolts of Atlantic salmon (Salmo salar) and American eel (Anguilla rostrata) were homogenized, washed, acetone-dried, and pulverized for use in determining their ability to hydrolyze polyoxyethylene (POE) esters. Blood serum was prepared for the tests by centrifugation. Six POE esters which are commonly used as oil dispersants, were investigated: POE (4) monolaurate, POE (9) monolaurate, POE (14) monolaurate, POW (14) dilaurate, POE (9) mono-oleate, and POE (4) lauryl ether. Activity of esterase was determined by continuous titration of product acid with NaOH. Reaction velocity was also determined. The livers of Atlantic salmon and American eel were able to hydrolyze POE esters at rates which depended on POE chain length. Increased chain length decreased hydrolysis rate. It is concluded that if hydrolysis of these compounds by tissues detroxifies them, eels should be less susceptible than salmon since they hydrolyze the compounds more rapidly than salmon. (Little-Battelle)
W73-15087

EXPOSURE OF DOGFISH SHARK FETI TO MERCURY,
Oregon State Univ., Astoria. Sea Food Lab.
For primary bibliographic entry see Field 05C.
W73-15088

COMPARISON OF THE METABOLISM OF PARATHION BY LOBSTERS AND RATS,
Rhode Island Univ., Kingston. Coll. of Pharmacy.
For primary bibliographic entry see Field 05C.
W73-15090

RESIDUES OF MIREX IN CHANNEL CATFISH AND OTHER AQUATIC ORGANISMS,
Animal and Plant Health Inspection Service, Gulfport, Miss.
For primary bibliographic entry see Field 05C.
W73-15091

ORAL TOXICITY OF CHLORINATED DIBENZOFURANS TO JUVENILE ATLANTIC SALMON,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 05C.
W73-15092

TRANSPORT, DISTRIBUTION, AND DEGRADATION OF CHLORINATED HYDROCARBON RESIDUES IN AQUATIC MODEL ECOSYSTEMS,
Lund Univ. (Sweden). Dept. of Animal Ecology.
A. Sodergren.
Oikos, Vol 24, No 1, p 30-41, 1973. 14 fig, 1 tab, 30 ref.

Descriptors: *DDE, *DDT, Model studies, *Chlorophyta, *Biodegradation, Absorption, Freshwater fish, *Mollusks, *Bioassay, Food chains, Polychlorinated biphenyls, Distribution, Algae, Metabolism, Ecosystems, Gas chromatography, Mass spectrometry, Cultures, Perches, Air, Pikes, DDD, Path of pollutants, Minnows, Water analysis, Water pollution effects, *Chlorinated hydrocarbon pesticides.
Identifiers: *Clophen A 50, Transport, GC-mass spectrometry, Chemostat, Biotransformation, Chlorella, Pyrenoidosa, Leucaspius delineatus, p p'-DDE, p p'-DDT, Perca fluviatilus, Planorbis corneus, Lebistes reticulatus, Esox lucius, p p'-DDD, Mass spectra, Dechlorination, Bioaccumulation, Biological samples, Macroinvertebrates.

Transport, distribution, and degradation of Clophen A 50Ca commercial mixture of PCB, p,p'-DDE, and p,p'-DDT were investigated in laboratory-model ecosystems containing a green alga (Chlorella pyrenoidosa), a cyprinid (Leucaspius delineatus), a mollusk (Planorbis corneus), and fish (Esox lucius, Perca flavescens, Lebistes reticulatus) in various combinations. The model system consisted of a primary producer unit (a continuous-flow culture or chemostat) connected to separate compartments in which consumer organisms were kept. Effluent from the chemostat containing known concentration of cells and test substance was directed to different compartments. The test substance was taken up by feeding on

al cells, by sorption, or by a combination of se. Samples of air, water, and organisms in the tem were analyzed for residues by gas chro-tography and GC-mass spectrometry. (1) The stances tested were mainly taken up by lorella pyrenoidosa and only small fractions re recovered in the water and air of the systems. Transport of the test substances to the first sumer organisms (Leucaspius delineatus) was inly accomplished by the algae. (3) Molecules h low chlorine content in Clophen A 50 were raded when transported through the food in. (4) No major metabolic changes of p,p'-DE occurred during transport through the food in. (5) The producer organisms were not able to rade p,p'-DDT. At the primary and secondary sumer levels, p,p'-DDT was partly chlorinated to p,pl-DDE and p,p'-DDD. (Little-ttelle)
73-15103

CRODISTRIBUTION AND FEEDING OF THE T-SPINNING CADDISFLIES (TRICHOP-RA) OF A CANADIAN STREAM,
aterloo Univ. (Ontario). Dept. of Biology.
E. Williams, and H. B. N. Hynes.
kos, Vol 24, No 1, p 73-84, 1973. 5 fig, 8 tab, 55 .

escriptors: *Caddisflies, Separation techniques, ife cycles, *Niches, *Water temperature, Flow e, Benthic fauna, Sampling, Suspended solids, boratory studies, Currents (Water), Depth, anada, Food habits.
entifiers: Sorting, Hydropsyche sparna, Cheu-topsyche oxa, Chimarra aterrima, Macroinver-brates, *Eramosa River, Sample preparation, rvival, Trichoptera, Net size, Substrates.

et-spinning caddisflies in the Eramosa River, ntario were studied to investigate the effect of vironmental factors on the organisms, and to udy their feeding habits, nets, and life cycles. A rber-type square foot sampler was used to col-ct about ten samples per month. Samples were eserved with formalin, taken to the laboratory, ashed, drained and placed in a glass pitcher to hich calcium chloride and paraffin oil was added. pon stirring, the insects remained in the oil hich was poured off through a fine net. The three ost common species of caddisflies were picked om the floated material under a dissecting icroscope. These were Hydropsyche sparna, heumatopsyche oxa, and Chimarra aterrima. uspended matter was measured in the field. Mid-it contents of larvae were filtered and counted. ocks were collected six times and analyzed for ydropsychid nets, net size and net mesh. Life cy-es were determined using all the larvae and upae collected monthly. The survival of C. ater-ma was studied in the laboratory under varied onditions. Larvae of the three species were found prefer shallow, fast-flowing sites with large, oss-covered rocks. Several seasonal and inter-pecific differences were revealed. A hilopotamid species was found to occupy a dif-erent niche from two hydropsychid species, hiefly in terms of food and feeding, but no major cological differences could be demonstrated etween the last-mentioned species-pair. (Little-attelle)
W73-15104

ABUNDANCE, DISTRIBUTION AND OIL BIODEGRADATION POTENTIAL OF MICROORGANISMS IN RARITAN BAY,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 05C.
W73-15108

TUBIFICIDS AND WATER QUALITY: A REVIEW,
Central Electricity Generating Board, Ratcliffe-on-Soar (England). Freshwater Biology Unit.
For primary bibliographic entry see Field 05C.
W73-15109

USE OF THE HETEROTROPHIC ACTIVITY TECHNIQUE AS A MEASURE OF EUTROPHI-CATION,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-15110

PHYTOPLANKTON ORGANIZATION IN BAIE DES CHALEURS (GULF OF ST LAWRENCE),
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 02L.
W73-15111

WAX ESTERS IN TROPICAL ZOOPLANKTON AND NEKTON AND THE GEOGRAPHICAL DISTRIBUTION OF WAX ESTERS IN MARINE COPEPODS,
Scripps Institution of Oceanography, La Jolla, Calif.
R. F. Lee, and J. Hirota.
Limnology and Oceanography, Vol 18, No 2, p 227-239, March 1973. 7 tab, 35 ref.

Descriptors: *Zooplankton, *Nekton, *Copepods, Marine animals, *Ecological distribution, *Tropical regions, Pacific Ocean, Crustaceans, Lipids, Organic compounds, Marine fish, Chemical analysis, Invertebrates, Mollusks.
Identifiers: *Esters, *Wax, Squid, Chaetognaths, Decapods, Pelagic animals, Macroinvertebrates, Mysids, Gnathopausia, Euphausiids, Myctophidae, Chirundina streetsi, Euchirella brevis, Euchirella galeata, Euaugaptilus, Bathycalanus richardi, Calanus gracilis, Megacalanus longicornis, Calanus minor, Candacia aethiopica, Euchaeta marina, Paraeuchaeta, Valdiviella insignis, Eucalanus, Hemirhabdus grimaldi, Heterorhabdus, Mesorhabdus.

Analyses of zooplankton and nekton from the central South Pacific showed that surface and epipelagic zooplankton had small amounts of neutral lipids, mainly triglycerides, while deep-water tropical copepods had wax esters as the major lipid type, presumed to function as a reserve storage. The total lipid content and wax esters of tropical copepods captured at about 500 m were significantly lower than those of species from high latitudes. The median percentage of wax esters increased progressively from tropical to polar latitudes in nine species of Calanus and five or six species of Euchaeta. Deep-living tropical copepods had the same median percentage of wax esters as mesopelagic and bathpelagic copepods from a subtropical station. Caridean and penaeidean decapods and euphausiids showed less than 5 percent wax esters. Gnathophausia, a mesopelagic mysid, stored wax esters (32 percent of the lipid). A deep-water chaetognath (Eukrohnia sp.) and a mesopelagic cranchiid squid had over 25 percent wax esters. Fish species not previously analyzed containing more than 10 percent wax esters included three myctophids and members of the Astronesthidae, Cheilodipteridae, Gonostomatidae, Paralepididae, Scopelosauridae, and Sternoptychidae. (Holoman-Battelle)
W73-15117

THE OCCURRENCE AND DISTRIBUTION OF SOME AQUATIC PHYCOMYCETES ON ROSS ISLAND AND THE DRY VALLEYS OF VICTORIA LAND, ANTARCTICA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
R. A. Paterson.
Mycologia, Vol 65, No 2, p 373-387, March/April 1973. 25 fig, 12 ref.

Descriptors: *Aquatic fungi, *Ecological distribution, *Antarctic, *Isolation, Algae, Soil environment, Aquatic environment, Cultures, Sampling, Diatoms, Pollen, Cold regions.
Identifiers: *Phycomycetes, Oomycetes, *Ross Island, *Victoria land, Sample preparation, Chytrids, Scherffeliomyces appendiculatus, Chytridium versatile, Rhizophlyctis rosea, Rhizophydium proliferum, Phlyctochytrium recurvastomum, Catenophlyctis variabilis, Pythium tenue.

Water, soil, and alga samples collected on Ross Island and the dry valleys of Victoria Land during January and February, 1971, were found to contain monocentric chytridiaceous fungi, a blastocladiaceous fungus, and filamentous Oomycetes. Of the alga-infesting chytrids, only Scherffeliomyces appendiculatus and Chytridium versatile could be identified with certainty. Saprophytic chytrids which grew on baits were represented by Rhizophlyctis rosea, and two new species, Rhizophydium proliferum and Phlyctochytrium recurvastomum. Catenophlyctis variabilis occurred as a saprophyte of keratinous substrata. The Oomycetes were represented by Pythium tenue and an undetermined sterile species of Pythium. Aside from univerified observations of Aphanomyces, members of the Saprolegniaceae were lacking. The low diversity of aquatic Phycomycetes with frequent reoccurrence of a few species is noted and commented upon. (Holoman-Battelle)
W73-15120

MERCURY IN SEALS FROM EASTERN CANADA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. E. Sergeant, and F. A. J. Armstrong.
Journal of the Fisheries Research Board of Canada, Vol 30, No 6, p 843-846, June 1973. 2 tab, 8 ref.

Descriptors: *Mercury, *Canada, Chemical analysis, Food habits, Pollutant identification, Ecological distribution, Migration patterns, Heavy metals, Marine animals, Food webs, Food chains.
Identifiers: *Bioaccumulation, *Harp seals, *Grey seals, *Harbor seals, *Hood seals, Animal tissues, Seals (Animals), Liver, Heart, Intestine, Lungs, Pagophilus groenlandicus, Halichoerus grypus, Phoca vitulina, Cystophora cristata, Biological magnification, Atomic absorption spectrophotometry.

Mercury concentrations were measured in four species of seals having different migratory patterns and feeding ecology in order to clarify to some extent the distribution of mercury in the ocean and concentrations through the food chain. Portions of 0.1-0.5-g tissue were analyzed by the low-temperature acid digestion and atomic absorption method of Armstrong and Uthe (1971). Mercury concentrations were highest in liver (usually 1-100 ppm) but up to 387 ppm and lowest in blubber (usually 0.1 ppm). Levels in muscle ranged from less than 0.16 to 2.35 ppm. Values similar to those in muscle were found in the few specimens of heart, intestine, and lungs analyzed, and higher values in kidney and hair. Ratios of mercury in the liver to that in the muscle for adult seals were much greater than those found in two species of freshwater fish and three species of domestic animals exposed to wide ranges of mercury concentrations in their food. Mercury in seals increased with age and appeared to vary with the position in the marine food web of the organisms which they eat. Harp seals (Pagophilus groenlandicus), which feed on small pelagic fish and crustaceans, accumulated an order of magnitude less mercury than grey (Halichoerus grypus) and harbour (Phoca vitulina) seals, which live on large pelagic and benthic fish and cephalopods. However, grey and harbour seals are resident in eastern Canadian waters, which presumably contain

higher mercury levels than arctic waters, where harp seals spend about half the year. Yet hood seals (Cystophora cristata), which spent more than half the year in arctic waters but feed on large fish and cephalopods, had mercury levels as high as grey and harbour seals. (Holoman-Battelle)
W73-15123

TOXICOLOGY OF PESTICIDES: RECENT ADVANCES,
Mount Sinai School of Medicine, New York.
For primary bibliographic entry see Field 05C.
W73-15126

BIODEGRADATION OF OLEATES,
Veterans Administration Hospital, Houston, Tex.
J. Williams, and E. O. Bennett.
Jouranl Water Pollution Control Federation, Vol 45, No 8, p 1671-1681, August 1973. 7 fig, 2 tab, 36 ref.

Descriptors: *Microbial degradation, *Cultures, *Growth rates, Path of pollutants, Carbon.
Identifiers: *Pseudomonas aeruginosa, *Oleates, Biodegradability, Sodium oleate C, Morpholine oleate, Copper oleate, Magnesium oleate.

Because of the wide variety of man-made oleates being used in industry, tests were conducted to determine the biodegradability of a number of commercial compounds. The compounds studied were metal oleates, glycol oleates, glyceraol oleates, butyl, morpholine, methyl, triethanolamine oleates, and methyl hydroxyoleate. Pseudomonas aeruginosa cultures were prepared for the tests by growing on nutrient agar and resuspending in saline solution. The inoculum was placed in a flask containing mineral salts basal medium and a specified concentration of a particular fatty acid salt as the sole carbon source. Biodegradability was determined by the rate of growth of the bacteria in oleate medium and in a control medium. Sodium oleate which is known to be biodegradable served as a reference. The results indicate that the degree and rate of degradation of oleic and hydroxyoleic acids are affected by purity of the substrate, number or position of oleate substituents, presence of metallic substances, and concentration of the substrate. (Little-Battelle)
W73-15127

GROWTH AND CELL-SIZE DISTRIBUTION OF MARINE PLANKTONIC ALGAE IN BATCH AND DIALYSIS CULTURES,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 05C.
W73-15128

BERYLLUM UPTAKE BY THE COMMON GUPPY USING RADIOISOTOPE BE-7. I. PRELIMINARY STUDY: TRACER MECHANICS AND PROCEDURES,
Aerospece Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05C.
W73-15135

BERYLLIUM UPTAKE BY THE COMMON GUPPY USING RADIOISOTOPE BE-7. II. BERYLLIUM CONCENTRATION IN FISH,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05C.
W73-15136

MERCURY POLLUTION AND ENFORCEMENT OF THE REFUSE ACT OF 1899 (PART 3).
For primary bibliographic entry see Field 05G.
W73-15167

NEBRASKA IS NO. ONE.

Calf News, p. 38-39, July, 1972, 8 fig.

Descriptors: *Feed lots, Cattle, *Farm wastes, Odor, Irrigation, *Laboratories, Percolation, Soil analysis, *Nebraska.

Facilities of the Agricultural Research Service at the University of Nebraska were observed. A well equipped laboratory was found that supplies data which a computer stores and disseminates. Field sampling sites were examined. Runoff, air and water penetration into the soil, irrigation, and cattle breeding are only a few of the studies made through use of these facilities. (Wetherill-East Central)
W73-15171

HYPOTHALAMIC TEMPERATURE REGULATION IN CATTLE,
Texas A and M Univ., College Station.
R. E. Stewart, and E. M. Bailey, Jr.
Paper No 72-511 presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, 20 p, 10 fig, 2 tab, 9 ref.

Descriptors: *Cattle, *Temperature control, Humidity.
Identifiers: *Hypothalmus, *Craniotomy, Cannulae, Respiration rate, Thermal environment, Hypothalmic heating, Rectal temperature, *Hypothalmic temperature.

It was theorized that routine access to the hypothalamus by the means of indwelling cannulae would allow rapid testing of efficiency in control of body temperature of cattle. A semi-stereotaxic method for cannulae installation was developed. The heat loss center of two female beef calves was heated by RF energy; some degree of correlation was observed between hypothalamic temperature and respiration rate. Animals were subjected to a step change in thermal environment (75 degrees to 95 degrees with very high humidity); rectal and hypothalamic temperatures were found to be coupled by the respiration rate, with marked individual differences. The approach appears to have merit as a system for rapid indentification of heat tolerant breeds and individuals. (Wetherill-East Central)
W73-15174

CORRELATING OIL AND ODOROUS COMPONENTS IN STORED DAIRY MANURE,
Clemson Univ., S.C.
C. L. Barth, D. T. Hill, and L. B. Polkowski.
Paper No 72-950 presented at 1972 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-15, 1972; Order No. M172-950, 17 p, 9 fig, 2 tab, 24 ref.

Descriptors: *Odor, *Chemical properties, Physical properties, Air pollution, Dairy industry, *Farm wastes, Cattle, Waste storage, Ammonia, Hydrogen sulfide, Hydrogen ion concentration.
Identifiers: *Odor intensity index, Liquified waste management, Odorants, Volatile organic acid, Acetic acid.

Three common odorants were identified and measured in stored dairy manure. A panel was selected to judge these odors which were present in only one of three flasks per set. The odorous flasks represented various degrees of aeration treatment. Results showed that odorous components derived from lower aeration depths were the most difficult to distinguish. An odor intensity index (OII) was established from the experimental results. Volatile organic acid correlated best with the OII. Second best was hydrogen sulfide and poorest was ammonia. (Frantz-East Central)
W73-15177

USING ODOR INTENSITY LIMITS IN AIR QUALITY STANDARDS,
Clemson Univ., S.C. Dept. of Agricultural Engineering
For primary bibliographic entry see Field 05G.
W73-15178

PRINCIPLES OF FEEDLOT ODOR CONTROL.
Texas Agricultural Extension Service, College Station
J. M. Sweeten.
December 1, 1972, 8 p, 4 ref.

Descriptors: *Air pollution, *Feed lots, *Farm wastes, Aerobic bacteria, Moisture contents, Temperature, Waste treatment, Poultry, Lagoons, Waste disposal.
Identifiers: *Odor control, Odor measurement, Odor intensity, Odor quality.

The major obstacle to developing effective odor control techniques, writing quidelines for feedlot odor control, and litigation of feedlot odor cases is the lack of suitable quantitative methods for measuring the intensity and quality of odors. Measuring odor intensity is usually done by diluting with odor-free water; however, measurement of odor quality is difficult because of the lack of an accepted standard. The physical variables which affect the generation of malodors from manure are temperature and moisture content. Experiments with poultry manure have shown that manure odor intensities are proportional to moisture content. This has suggested two approaches to odor control of feedlots- (1) maintenance of aerobic conditions for decomposition, and (2) the chemical treatment of manure. Judicious site selection of feedlots with respect to surrounding land use patterns and climatic factors is a third alternative which has had some success. (Dudley-East Central)
W73-15181

CHROMIC OXIDE AND CRUDE PROTEIN EXCRETION IN THE BOVINE AS INFLUENCED BY WATER RESTRICTION,
Kentucky Univ., Lexington.
D. L. Cross, J. A. Boling, and N. W. Bradley.
Journal of Animal Science, Vol 36, No 5, p 982-985, May, 1973, 2 fig, 4 tab, 12 ref.

Descriptors: *Farm wastes, *Proteins, *Cattle, Metabolism.
Identifiers: *Chromic oxide, *Water restriction, Dry matter digestibility, Fecal dry matter.

Twelve yearling Angus steers were assigned to two periods and two treatments in an experiment designed to study the effect of water restriction on the excretion of chromic oxide and crude protein. Each steer was confined to a metabolism crate and received 4 kg. of a ration plus water free choice of 60% free choice daily. During each period, fecal samples were taken at 2 hour intervals for 48 hours followed by a 7 day total collection of feces. The percent recovery of chromic oxide averaged 103.1 and 102.3 respectively for the steers offered water free choice or 60% of free choice. There was an increase in dry matter digestibility and chromic oxide concentration in fecal dry matter when water was restricted Water restriction did not affect crude protein concentration of fecal dry matter. These data suggest that water restriction has little effect on the excretion of chromic oxide and crude protein. (Marquard-East Central)
W73-15182

NITROGEN IN INDUSTRY,
National Environmental Research Center, Cincinnati, Ohio, Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W73-15186

ON SPENT SEMICHEMICAL PULPING LIQUORS. (I). SPECIES VARIATION OF PULPING TIMBERS COLOR AND CHEMICAL OXYGEN DEMAND, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
R. Kondo, K. Sameshima, and T. Kondo.
Japan Tappi, Vol 26, No 8, p 401-408, Aug 1972, 12 fig, 3 tab, 6 ref. (English summary).

Descriptors: *Sulfite liquors, *Pulp wastes, *Color, *Chemical oxygen demand, *Hardwood, *Softwood, Deciduous trees, Coniferous trees, Foreign research, Specific gravity, Density, Effluents, Pulp and paper industry, Liquid wastes, Industrial wastes, Waste water (Pollution), Hydrogen ion concentration, Wood wastes, Bark.
Identifiers: *Pulpwood, Tropical plants, Tropical trees, Sulfite pulping, NSSC pulping, Japan, Wood, Wood properties, Black liquor, Spent pulping liquors, Spent NSSC liquor, Pulp yield.

Differences in the color and COD of spent NSSC (neutral sulfite semichemical) pulping liquors were examined as a function of pulpwood species, including Japanese and tropical hardwoods, such as Castanopsis cuspidata, Actinodaphne lancifolia, and species of Carpinus, Shorea, Pentacme, and Dryobalanops, either pulped singly or in various mixtures. Although considerable differences in the spent liquor color were noted, depending on the wood species, there were no great differences in COD. The volume of spent cooking liquor was proportional to the apparent specific gravity of the wood. This gave rise to differences in the distribution of total solids, color, and COD among the liquid effluents isolated at different stages of cooking, pulp washing, and defibration (fiber liberation). The color and COD from lauan species (Shorea and Pentacme), for example, originated mainly from the black liquor. Among all wood species examined, black liquor contributed at most 50% of the total effluent color and COD. With increased black liqur pH, both the effluent color and the pulp yield increased for Japanese hardwoods, but not for tropical species (Shorea, Pentacme, and Dryobalanops). At a given pulp yield, the maximum cooking temperature had no effect on effluent color and COD. Removal of bark reduced the color but raised the COD of effluents. (Brown-IPC)
W73-15189

SEASONAL FLUCTUATIONS OF AQUATIC MACROINVERTEBRATES IN OAKWOOD BOTTOMS GREENTREE RESERVOIR,
Tennessee Valley Authority, Norris.
For primary bibliographic entry see Field 05C.
W73-15209

ANTIMICROBIAL EFFECTS OF AQUATIC PLANTS FROM MINNESOTA,
Minnesota Univ., Minneapolis. Coll. of Pharmacy.
For primary bibliographic entry see Field 05C.
W73-15228

PACIFIC NORTHWEST LABORATORY ANNUAL REPORT FOR 1972. VOLUME II: PHYSICAL SCIENCES, PART 1. ATMOSPHERIC SCIENCES,
Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Program.
C. L. Simpson.
Available from NTIS, Springfield, Va., as BNWL-1751, Vol. II, Pt. 1; $7.60 in paper copy, $1.45 in microfiche. Report BNWL-1751, Vol. II, Part I, April 1973. 152 p.

Descriptors: *Air pollution, *Fallout, *Precipitation (Atmospheric), *Soil contamination, Effluents, Nuclear wastes, Path of pollutants, Aerosols, Smog, Aircraft, Application equipment, Nuclear powerplants, Nuclear explosions, Tracers, Diffusion, Meteorologic data, Forecasting, Mathematical models, Tritium, Public health.
Identifiers: *Plutonium, Scavenging.

Pu sampling data and meteorological data from Rocky Flats, Colorado, were used to identify significant factors regarding resuspension of Pu-contaminated soil. Capabilities were developed for research aircraft for generation of tracers in studies of scavenging and for measurement of aerosols downwind of urban areas. Work in defining and explaining radionuclide distributions from specific nuclear-testing events is continuing and is being extended to include effluents from nuclear power plants. Diffusion, deposition, and turbulence models (including near-calm wind) were applied to various terrains. Experiments were conducted to provide data for modeling particle deposition and wet scavenging. (Bopp-ORNL)
W73-15233

SOURCES OF TRITIUM AND ITS BEHAVIOR UPON RELEASE TO THE ENVIRONMENT,
Oak Ridge National Lab., Tenn.
D. G. Jacobs.
Available from NTIS, Springfield, Va., as TID-24635; $5.45 per paper copy, $1.45 microfiche. Report No TID-24635, 1968. 96 p, 4 fig, 9 tab, 370 ref.

Descriptors: *Tritium, *Effluents, *Nuclear powerplants, Monitoring, Behavior, Environment, Ecology, Water pollution, Water pollution sources, Assay, Absorption, Biological uptake, Biological membranes, Public health.

This report is the first in the AEC Critical Review Series, a series of state-of-the-art studies prepared for the Atomic Energy Commission. Published information on tritium production and the pertinent factors that affect the behavior of tritium in the environment are reviewed. Because of the extremely large number of publications dealing with tritium, the review is not exhaustive; however, the most important aspects have been mentioned and extensive references are given. Estimates are made for production and accumulation of tritium in an expanding nuclear power economy, including the impact of an increased tritium production on local and worldwide populations. Monitoring practices and instruments for the detection and assay tritium are given. The behavior of tritium in the environment, including the stratosphere, troposphere, deposition on the ground surface, and releases to surface waters and groundwaters, is examined. (Houser-ORNL)
W73-15234

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF VIRGIL C. SUMMER NUCLEAR STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Document 50395-36, $5.45 per copy, $1.45 microfiche. Document No. 50395-36, Jan. 1973. 292 p, 30 fig, 38 tab, 118 ref, 3 append.

Descriptors: *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Plankton, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *South Carolina, Lakes, Iodine radioisotopes.
Identifiers: *Pressurized water reactor, Monticello Reservoir, *Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of the Virgil C. Summer Nuclear Station Unit 1 located near Parr, South Carolina. This station will use a pressurized water reactor. The exhaust steam will be cooled and condensed by once-through flow of water from Monticello Reservoir. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Some of the environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded that a construction permit should be issued for the facility subject to the following conditions: (1) make preoperational measurements for a baseline upon which to evaluate possible adverse effects; (2) propose a plan for an operational environmental monitoring program; (3) construct transmission lines in accordance with federal guidelines; (4) follow appropriate guide lines for sanitation in recreational areas; and (5) maintain radioiodine concentration to specified levels. (Houser-ORNL)
W73-15235

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF QUAD-CITIES NUCLEAR POWER STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Document No. 50254-120, $10.60 per copy, $1.45 microfiche. Document No. 50254-120, Sept. 1972. 341 p, 14 fig, 25 tab, 152 ref, 3 append.

Descriptors: *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Illinois, Mississippi River.
Identifiers: *Boiling water reactors, *Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the operation of the Quad-Cities Nuclear Power Station Units 1 and 2, near Cordova, Illinois. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Some of the environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The exhaust steam will be cooled by once-through condenser cooling water from the Mississippi River with a diffuser-pipe discharge until a spray-canal cooling system is completed. It is concluded to continue the facility operating license subject to the following conditions: (1) define a monitoring program to determine changes in the ecosystems; (2) define a radiological monitoring program to determine radiological effects of operation; (3) provide certain reports describing results of the environmental monitoring program; and (4) propose technical specification changes prior to operation of the spray-canal cooling system. (Houser-ORNL)
W73-15236

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF COOPER NUCLEAR STATION.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Document No. 50298-69, $7.60 per copy, $1.45 microfiche. Document No. 50298-69, February 1973. 263 p, 22 fig, 39 tab, 91 ref, 3 append.

Descriptors: *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Missouri River, *Nebraska.
Identifiers: *Boiling water reactors, *Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction and operation of the Cooper Nuclear Station, a boiling water reactor located on the Missouri River near Brownsville, Nebraska. The exhaust steam will be cooled by once-through flow of water obtained from and discharged to the Missouri River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Some of the environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded that the construction permit should be continued and an operating license be issued for this facility subject to the following conditions: (1) establish before licensing a non-radiological monitoring program to extend at least 5 years and to be reviewed annually, and to provide design modifications to mitigate detrimental effects; (2) conduct a radiological monitoring program. (Houser-ORNL)
W73-15237

FIELD SPECTROMETRIC MEASUREMENTS OF RADIONUCLIDE CONCENTRATIONS AND EXTERNAL GAMMA EXPOSURE RATES AT THE NEVADA TEST SITE, A DEMONSTRATION STUDY,
California Univ., Livermore. Lawrence Livermore Lab.
L. R. Anspaugh, P. L. Phelps, G. W. Huckabay, and T. Todachine.
Available from NTIS, Springfield, Va.; $4.00 in paper copy, $1.45 microfiche. Report UCRL-51412, July 1973. 18 p, 3 fig, 1 tab.

Descriptors: *Radioisotopes, *Nuclear explosions, *Fallout, *Gamma rays, Soil contamination, Analytical techniques, Sampling, Radioactivity techniques, Nuclear wastes, *Nevada, Irradiation, Radioactivity, Instrumentation.

The information obtained by the field spectrometry method is more suitable for calculating the external dose as compared with airborne detector systems. Elimination of soil sampling makes the method relatively rapid; however, the accuracy of the dose calculation may be improved by the use of soil sampling to obtain depth-distribution data. No information is obtained concerning alpha- or beta-emitters that have no associated gamma emmission. Radionuclide concentrations and external dose calculations are given at 14 locations. Ru101, Eu152, Eu154, and Lu174 were detected only close to the Sedan crater. Rh102m was the most abundant radionuclide in the three locations closest to the crater. Cs137 was substantially above the level usually attributed to world-wide fallout. Venting of the Baneberry test contributed significantly to levels of Ru106, Mn54, Co60, Sb125, and Cs134. (Bopp-ORNL)
W73-15238

GREAT LAKES RADIOECOLOGY,
Argonne National Lab., Ill.
J. S. Marshall, D. N. Edgington, S. A. Spigarelli, and M. A. Wahlgren.
Available from NTIS, Springfield, Va., as ANL-7960, Part 3; $7.60 in printed copy, $1.45 in microfiche. In: Report ANL-7960, Part 3, p 1-6, Jan.-Dec. 1972. 1 fig, 1 tab.

Descriptors: *Nuclear wastes, *Strontium radioisotopes, *Radioecology, Great Lakes, Absorption, Freshwater fish, Path of pollutants, Environmental effects, Amphipoda, Opossum shrimp, Trace elements, On-site data collections, *Lake Michigan.
Identifiers: *Plutonium, *Cesium radioisotopes.

Cycling of Pu239, Cs137, and Sr90 within the Lake Michigan ecosystem is being studied by sampling organisms, sediment, and water from various locations, including present and future nuclear sites. Vertical distributions of long-lived radionuclides (Pu239, Cs137, and Sr90) are determined in selected areas of the lake to benefit estimating lake inventories. Information on vertical mixing, water-mass residence times, and sedimentation characteristics of various lake regions is obtained from comparisons of inshore and offshore concentrations of these radionuclides. Relations in the distribution and cycling in biogeochemical systems between radionuclides and other trace elements are correlated. A significant contrast lies in both the time span during which inputs have occurred, and the type of input (general atmospheric fallout for radionuclides and largely point sources for certain trace elements). (Bopp-ORNL)
W73-15239

THE USE OF NATURAL AND FALLOUT RADIONUCLIDES TO MEASURE RECENT SEDIMENTATION RATES IN SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Ill.
J. A. Robbins, and D. N. Edgington.
Available from NTIS, Springfield, Va., as ANL-7960, Part 3; $7.60 in printed copy, $1.45 in microfiche. In: Report ANL-7960, Part 3, p 31-53, Jan.-Dec. 1972. 6 fig, 5 tab, 23 ref.

Descriptors: *Fallout, *Sedimentation rates, *Lake Michigan, *Tracers, Carbon radioisotopes, Potassium radioisotopes, Strontium radioisotopes, Lead radioisotopes, Path of pollutants.
Identifiers: *Cesium radioisotopes, *Plutonium.

The sedimentation rate is calculated from the Pb210 concentration in sediment cores, assuming constant atmospheric fallout and homogeneous mixing of an interfacial sediment layer. A small amount of data for Cs137 suggests a similar model. Although the relatively shallow depth of Cs137 occurrence requires high-resolution sampling, it appears that determination of the Cs137/Pb210 ratio for a wide range of sedimentation rates will give information about transport and deposition processes. (Bopp-ORNL)
W73-15240

CONSIDERATIONS IN THE ASSESSMENT OF THE CONSEQUENCES OF EFFLUENTS FROM MIXED OXIDE FUEL FABRICATION PLANTS. ENVIRONMENTAL CONSIDERATIONS AFFECTING CONSEQUENCES OF RELEASES,
Battelle-Pacific Northwest Lab., Richland, Wash.
J. M. Selby, E. C. Watson, J. P. Corley, D. A. Waite, and L. A. Carter.
Available from NTIS, Springfield, Va., as BNWL-1697, $3.00 in printed copy. In: Report BNWL-1897, p 24-45, June 1973. 17 fig, 28 tab, 135 ref.

Descriptors: *Nuclear wastes, *Industrial wastes, *Environmental effects, *Radioactivity, Air pollution, Public health, Effluents, Path of pollutants, Food chains, Potable water.
Identifiers: *Plutonium, Nuclear fuel fabrication plants.

Probabilities were developed of releasing radioactive material from a reference plant having design features consistent with the minimum criteria for new AEC plutonium facilities. The building final-filter system has two stages of high-efficiency filters. The most important exposure pathway is identified as inhalation of airborne plutonium. Pathways through consumption of drinking water and through aquatic food chains are lower by four orders of magnitude. Limits are proposed for surface contamination and for the annual dose rate to the general population from the continuous release of plutonium. An area is judged to be contaminated if the activity exceeds 10 nanocuries/sq m. The main chemical contaminants (fluorine and nitrogen) will be well below the recommended threshold limit. (Bopp-ORNL)
W73-15241

SYNOPTIC MEASUREMENTS OF CURRENTS AND SEDIMENT TRANSPORT ON THE CONTINENTAL SHELF, (ANNUAL PROGRESS REPORT),
Washington Univ., Seattle.
R. W. Sternberg
Available from NTIS, Springfield, Va., as RLO-2225-T21-10; $4.00 in paper copy, $1.45 in microfiche. Report RLO-2225-T21-10, April 1973. 12 p, 3 fig, 3 tab, 35 ref. AEC-AT (45-1)-2225.

Descriptors: *Sediment transport, *Oceanography, *Continental shelf, *Turbidity currents, Washington, Columbia River, Silts, Suspended solids, Waves (Water), Instrumentation, Estuarine environment, Bottom sediments, Marine geology, Currents (Water), Microenvironment, Sediment distribution.

Preliminary data from sea-floor instruments suggest that sediment transport exceeds estimates based on a threshold value of the mean bottom current. Preliminary analysis indicates that oscillatory motions due to surface waves produced relatively large concentrations of suspended sediment 100% of the time at 78 and 40 m depths, and 8% at 167 m. In a previous measurement at 80 m, sediment suspensions were produced and maintained by wave movements for at least 21 days in March. (Bopp-ORNL)
W73-15242

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF TURKEY POINT PLANT, UNITS 3 AND 4.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Document 50250-84; $10.60 per copy, $1.45 microfiche. Document 50250-84, July 1972. 369 p, 12 fig, 28 tab, 79 ref, 6 append.

Descriptors: *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Florida.
Identifiers: *Pressurized water reactors. *Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed operation of the Turkey Point Plants, Units 3 and 4, Dade County, Florida. The initial cooling system will be a once-through with salt water. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, and amount of dissolved oxygen and toxic chemicals in effluent

water. The conclusion is to issue an operating license for the two units, 3 and 4, subject to further detailed evaluation of the environmental impact of construction and operation of the cooling-channel system. The applicant will also pursue evaluations of alternatives to the proposed cooling-channel system. Finally, the applicant will take corrective action for any adverse effects found. (Houser-ORNL)
W73-15243

ROLE OF THE ORGANIC MATTER OF A WATERWAY WITH REGARD TO RADIOACTIVE POLLUTION (INFLUENCE DES CONDITIONS D'EXTRACTION SUR LE FRACTIONNEMENT COMPORTEMENT DES ELEMENTS CHIMIQUES VIS-A-VIS DE LA MATIERE ORGANIQUE),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
J. Faure.
Available from NTIS, Springfield, Va., as CEA-R-4443; $5.45 in paper copy, $1.45 in microfiche. Report CEA-R-4443, March 1973. 53 p, 18 fig, 6 tab, 27 ref, 3 append.

Descriptors: *Chelation, *Sediments, *Nuclear wastes, *Rivers, Europe, Absorption, Organic soils, Analytical techniques, Separation techniques, Organic matter, Humic acids, Oxidation, Molecular structure, Ions, Soil contamination, Trace elements, Chemical degradation, Spectrophotometry, Chromatography.
Identifiers: Gel filtration chromatography.

Rhone River sediments were studied by analytical techniques that are described (extraction of organic matter with 0.01 N caustic, fractionation by gel filtration chromatography, and analysis for carbonyl and peroxide groups by spectrophotometry). Non-conjugated carbonyl groups contributed importantly to sorption of radionuclides. Sorption increased with increasing ionic radius (in the order Cr, Ru, Zn, Mn) in the case of the 500-1500 molecular-weight fraction, which was the largest fraction and had the highest carbonyl/peroxide ratio. The correlation with ionic radius predicts that the transition elements in the first two groups most susceptible to complexing by organic matter are: Sc (3+), Fe (3+), Ni (++), Cu (++), Y (3+), Zr (4+), Rh (++), Pd (++), and Cd (++). Lanthanides probably resemble Ce (3+), which has similar ionic radius. Hypotheses concerning sorption of other elements and the structure of complexes are discussed. (Bopp-ORNL)
W73-15244

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT,
Argonne National Lab., Ill.
R. E. Rowland.
Available from NTIS, Springfield, Va., as ANL-7960, Part 3; $7.60 in printed copy, $1.45 microfiche. Report ANL-7960, Part 3, Dec. 1972. 163 p, 19 ref.

Descriptors: *Radioecology, *Research and development, *Thermal pollution, *Nuclear wastes, *Lake Michigan, Environmental effects, Vegetation, Sulfur compounds, Tritium, Path of pollutants, Radioactivity effects.
Identifiers: *Plutonium.

Current programs include: (1) assessment of the transport and fate of trace elements entering Lake Michigan via the Grand River (this provides a natural analog for effects from effluents from a large nuclear powerplant), (2) the radioecology of plutonium in Lake Michigan, (3) behaviorial responses of fish to thermal effluents from the Point Beach Nuclear Powerplant, (4) behavior of tritium and plutonium in air-plant-soil systems, and (5) resistance of plants to sulfur dioxide and radiation, respectively. (Bopp-ORNL)
W73-15246

RADIOCESIUM DISTRIBUTION IN WATER, SEDIMENT, AND BIOTA IN THE HUDSON RIVER ESTUARY FROM 1964 THROUGH 1970,
New York Univ. Medical Center, N.Y.
M. E. Wrenn, J. W. Lentsch, M. Eisenbud, G. J. Lauer, and G. P. Howells.
Proc. available from NTIS, Springfield, Va., as CONF-710501; $27.20 (2 vol. set) in paper copy, $1.45 per vol microfiche. In: 3rd National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 334-343 (1971).

Descriptors: *Hudson River, *Estuarine environment, *Fallout, *Nuclear wastes, Effluents, Nuclear powerplants, Fish, Fish diets, Sediments, Water analysis, On-site investigations, Path of pollutants, Food chains, Public health, Monitoring.

An increase in Cs137 in river water was seen in a limited section of the Hudson River from the Indian Point Nuclear powerplant although fallout is the major source. The concentrations in sediments, aquatic plants, and fish were roughly in the ratios of 30:1:1. Data on fish were modeled since fish consumption is the major route of exposure to man. It is shown that the Cs137 in sediments controls that in fish, since although the concentration in water has been decreasing (an order of magnitude since 1964) the concentration in fish has varied little from year to year (the maximum was about 56 picoCuries/kg in 1969). Concentrations were highest in bottom feeding species such as catfish and suckers, intermediate in plant-eating species such as killifish, and lowest in anadromous fish such as shad. Concentrations in the river fish were generally an order of magnitude lower than in fish from lakes in this latitude. (Bopp-ORNL)
W73-15247

ASSIMILATION AND RETENTION OF ZN65 BY THE MALLARD DUCK (ANAS PLATYRHYNCHUS),
Colorado Cooperative Wildlife Research Unit, Fort Collins.
R. D. Curnow.
Proc. available from NTIS, Springfield, Va., as CONF-710501; $27.20 (2 vol. set) in paper copy, $1.45 per vol microfiche. In: 3rd National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 381-383 (1971). 4 tab.

Descriptors: *Zinc radioisotopes, *Nuclear wastes, *Food chains, *Mallard duck, Aquatic environments, Absorption, Path of pollutants, Seasonal.

Assimilation and retention of Zn65 by the mallard duck (Anas platyrhynchos) as influenced by age and sex, season of year, feather molt and egg production were investigated. Absorption of oral Zn65 was influenced by season of year but not by the age or the sex. In March, absorption from the gastrointestinal tract was significantly greater than in October. The effective half-time of Zn65 in the mallard was affected by sex and season but not by the age of the duck. Zinc-65 retention was significantly greater in male mallards (P greater than 0.01) and in October. Egg production accounted for the elimination of 25% of injected Zn65. Feather molt in the mallards accounted for a 2 to 8% elimination of retained Zn65. Causative mechanisms for the observed differences in the absorption and excretion of Zn65 between male and female mallards and between seasons were discussed. (Bopp-ORNL)
W73-15248

OCCURRENCE OF RADIONUCLIDES IN THE EXOSKELETON OF TURTLES,
Mississippi State Coll. for Women, Columbus. Dept. of Physical Science.
C. M. Holcomb.
Proc available from NTIS, Springfield, Va., as CONF-710501; $27.20 (2 vol. set) in paper copy, $1.45 per vol microfiche. In: 3rd National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 385-389. (1971).

Descriptors: *Strontium radioisotopes, *Aquatic environment, *Turtles, *Nuclear wastes, Radioecology, Absorption, Bioindicators, Monitoring.

A preliminary investigation showed that turtles are indicators of Sr90 fallout. Advantages as long-term biological monitors are their geographic distribution, relative abundance, and long life-span. One hundred two individuals collected from six southeastern states (representing two families, six genera, and eight species) ranged in Sr90 from 0 to 282 picoCuries/g of bone ash. An inverse correlation with animal size in some taxa, and geographical differences, were found. (Bopp-ORNL)
W73-15249

UPTAKE AND RETENTION OF TUNGSTEN-181 BY CRAYFISH (CAMBARUS LONGULUS LONGEROSTRIS ORT.),
Oak Ridge National Lab., Tenn.
J. R. Reed, and B. A. Martinedes.
Proc available from NTIS, Springfield, Va., as CONF-710501; $27.20 (2 vol. set) in paper copy, $1.45 per vol microfiche. In: 3rd National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 390-393 (1971). 3 fig, 1 tab, 11 ref.

Descriptors: *Nuclear wastes, *Food chains, *Crayfish, Path of pollutants, Fallout, Radioecology, Absorption, Aquatic environments, Public health.

The whole-body uptake and retention of W181 was studied in crayfish (Cambarus longulus longerostris Ort.). During a 16-day uptake period in which the medium was not renewed, large animals accumulated more W181 than small ones, but uptake per gram was similar for small and large crayfish. The whole-body elimination curve for W181 consisted of two components, a rapid one-day component and a second slower component with a biological half-time of 12.2 days. The exoskeleton, GI tract, hepatopancreas, and gills reached higher concentrations than the muscle and gonads. (Bopp-ORNL)
W73-15250

IRON, MANGANESE, COBALT, AND ZINC CYCLES IN A SOUTH CAROLINA RESERVOIR,
Savannah River Ecology Lab., Aiken, S.C.
J. S. Marshall, and J. H. LeRoy.
Proc. available from NTIS, Springfield, Va., as CONF-710501; $27.20 (2 vol. set) in paper copy, $1.45 per vol. in microfiche. In: 3rd National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 465-473, (1971). 4 fig, 4 tab, 21 ref.

Descriptors: *Reservoirs, Plankton, Cycling nutrients, *Iron, *Cobalt, *Manganese, *Zinc, *South Carolina, Plankton nets, Suspended solids, Epilimnion, Seston, Radioecology, Seasonal, Path of pollutants, Nuclear wastes, Tracers, Zinc radioisotopes, Cobalt radioisotopes.

The distribution of Fe, Mn, Co, and Zn and the sorption of radioisotopes of these elements by seston were studied during 24 months in Par Pond, a warm monomictic reservoir in South Carolina. The dissolved and particulate forms of these elements exhibit marked seasonal variation in the epilimnion; the annual maximum concentrations are late in the thermal stratification period (April-October) and early in the fall-winter overturn. The average percentages of elements that are particulate in surface water are: Fe (65%), Mn (86%), Co (22%), and Zn (15%). Particulate Fe, Mn, and Co associate principally with inorganic matter; particulate Zn does not. The average percentages of the particulate form of elements associated with net plankton are: Fe (1.2%), Mn (0.89%), Co (4.4%), and Zn (8.7%). The fraction of added Fe59 that is retained by a filter with 0.45 micron pores after 24-hr in situ incubation closely approaches

the fraction of total iron that is particulate; however, the sorption of Mn54, Co57, and Zn65 is probably controlled by the age and concentration of the particulate manganese. (Bopp-ORNL)
W73-15251

FEEDING RATES AND FOOD UTILIZATION OF STREAM CADDISFLY LARVAE OF THE GENUS NEOPHYLAX (TRICHOPTERA:LIMNEPHILIDAE) USING COBALT-60 AND CARBON-14,
Pittsburgh Univ., Pa. Pymatuning Lab. of Ecology.
J. R. Sedell.
Proc. available from NTIS, Springfield, Va., as CONF-710501; $27.20 (2 vol. set) in paper copy, $1.45 per vol. in microfiche. In: 3rd National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 486-491, (1971).

Descriptors: *Fish, *Food chains, *Radioecology, *Path of polluants, Algae, Aquatic animals, Streams, Cobalt, Carbon, Absorption, Fish diets, Cycling nutrients, Aquatic environment, Trace elements.

Feeding rates and food utilization by N. concinnus were determined using Co60 and C14 as food markers and experimental designs which used the individual as a block in order to eliminate individual variation. Using a short-term radionuclide method employing Co60 passage rates of food through the gut were determined for two different instars. The type of microflora on the natural substrate did not significantly affect ingestion rates. Naturally occurring foods on stream rocks were tagged with Co60, C14 bicarbonate, and C14 glucose. Instar III and IV animals were allowed to feed on the dual-tagged substrates for 1 to 2 hr. Approximate assimilation efficiency for instar III was 15 plus or minus 2% (plus or minus S.E.), and for instar IV 26.7 plus or minus 3.0%. When instar IV animals were fed on food tagged with just Co60 and C14 bicarbonate, the approximate assimilation efficiency was between 4.7 and 6.6%. Differences in assimilation efficiencies are discussed. (Bopp-ORNL)
W73-15252

EXPERIMENTAL UPTAKE AND CHEMICAL FRACTIONATION OF IODINE-131 AND IRON-59 IN A TURTLE GRASS (THALASSIA TESTUDINUM) BED,
Puerto Rico Nuclear Center, Mayaguez.
S. E. Kolehmainen.
Proc. available from NTIS, Springfield, Va., as CONF-710501; $27.20 (2 vol. set) in paper copy, $1.45 per vol. in microfiche. In: 3rd National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 829-835, (1971). 6 fig, 4 tab, 14 ref.

Descriptors: *Marine plants, *Iron, *Absorption, *Iodine radioisotopes, Nuclear wastes, Estuarine environment, Radioecology, Path of pollutants, Food chains, Water analysis.
Identifiers: *Iodine.

To obtain information about the fate of nuclear wastes, an experiment was conducted in which radioisotopes dissolved in unfiltered seawater were added to a turtle-grass bed in an outdoor container. It was deduced that knowledge of the chemical form of the radioisotope is essential for validity of the specific-activity concept, although the same specific activities of I131 and Fe59 were found in the turtle grass and sediment as in the water. Most Fe59 accumulated in sediment; most I131 in periphyton. Concentration factors for uptake by turtle grass were: Fe, 10- to 100-thousand; I, an order of magnitude lower. (Bopp-ORNL)
W73-15253

TURNOVER OF ZN65 IN OYSTERS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 05C.
W73-15254

AMCHITKA RADIOBIOLOGICAL PROGRAM PROGRESS REPORT FOR MARCH 1972 TO DECEMBER 1972,
Washington Univ., Seattle. Coll. of Fisheries.
E. E. Held, V. A. Nelson, W. R. Schell, and A. H. Seymour.
Available from NTIS, Springfield, Va., as NVO-269-19; $5.45 in paper copy, $1.45 in microfiche. Report NVO-269-19, June 1973. 90 p, 9 fig, 27 tab, 18 ref.

Descriptors: *Radioisotopes, Absorption, *Aquatic environment, *Estuarine environment, Tritium, Strontium radioisotopes, Potassium radioisotopes, Fallout, Nuclear wastes, *Alaska, Nuclear explosions, Water analysis, Radioactivity techniques, Radioecology, Food chains, Public health, Fish, Air pollution, Algae, Vegetation, Radioecology, Monitoring.
Identifiers: Beryllium radioisotopes, *Amchitka Island.

An extensive search with sensitive instruments for radionuclides in biological and environmental samples (marine, terrestrial, freshwater) collected during the first 14 months after the Cannikin detonation indicated no contamination of the surface environment. The radionuclides found were naturally occurring (Be7 and K40 were most abundant) or were from world-wide fallout, excepting for a trace of tritium contamination in some ponds near the Long Shot nuclear test. Recent data indicate: (1) no new radionuclides except that Be7 was included in the radionuclides that were determined, and (2) an improvement in the sensitivity of analysis for tritium to about 15 tritium units. The past and present analyses are summarized, including gamma-emitting radionuclides in air filters, seawater, freshwater, marine algae, marine invertebrates, marine fish, sea otter, and freshwater organisms (moss, plants, and fish); Sr90 in rats and birds; and tritium in seawater, freshwater, and fish. (Bopp-ORNL)
W73-15255

MERCURY CONCENTRATIONS IN SEDIMENTS OF THE LAKE ERIE BASIN, OHIO.
Geological Survey, Columbus, Ohio.

Ohio Division of Geological Survey Information Circular No 40, 1973. D. A. Stith, compiler. 14 p, 7 fig, 2 tab, 4 ref.

Descriptors: *Water pollution sources, *Mercury, *Sediments, *Lake Erie, *Tributaries, Sampling, Chemical analysis, Instrumentation, Analytical techniques, Data collections, Rivers, Evaluation, Path of pollutants.
Identifiers: *Lake Erie tributaries.

In 1970 sediment and water samples were taken from six different Ohio tributary/harbor systems of Lake Erie. Sampling of the Black River basin was carried out in 1970 and 1971. Mercury contamination was determined on these samples soon after collection, and the results on sediment samples are presented. Definite mercury contamination was detected in the Ashtabula River, Black River, and the Grand River; minor to relatively insignificant levels of mercury were noted in the Cuyahoga River, the Maumee River, Sandusky Bay, and Lake Erie. Background concentrations of mercury can be attributed to natural, agricultural, and industrial sources. The mercury is concentrated in stream sediments by the leaching action of groundwater on soil and by removal of mercury from the atmosphere by rain. (Woodard-USGS)
W73-15260

WATER POLLUTION CONTROL IN ASIA AND THE FAR EAST.
Economic Commission for Asia and the Far East (UN), New York
For primary bibliographic entry see Field 05G
W73-15271

THE ECOLOGY OF SOIL-BORNE PATHOGENS,
Agricultural Univ., Wageningen (Netherlands). Instituut voor Plantenziektenkundig Onderzoek
A. J. P. Oort.
Bull Oepp (Organ Eur Mediterr Prot Plant). 6 p 121-128, 1972. Illus.

Descriptors: Bacteria, Climates, Dispersal, Ecology, *Fungi, Human factor, Nematodes, *Pathogens (Soil-borne), Survival, *Virus

The complexity of the interrelations of the varying environmental factors which may affect the host, the pathogen and consequently the host-pathogen interaction is stressed. The effect of climatic conditions, soil properties, soil biota (nematodes, fungi, bacteria and viruses) and human influences is indicated. Two aspects of the ecology of soil-borne pathogens, viz. dispersal and survival, are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-15281

5C. Effects of Pollution

EFFECTS OF DEVELOPMENT ON SALINITY AND LIMNOLOGY OF THE LOWER COLORADO RIVER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. D. Evans, S. Ince, C. C. Kisiel, H. K. Qashu, and L. G. Everett.
Available from the National Technical Information Service as PB-223 907, $3.50 in paper copy, $1.45 in microfiche. Completion Report, August 1973. 61 p, 3 fig, 9 tab, 10 ref, append. OWRR A-036-ARIZ (3). 14-31-0001-3803.

Descriptors: Water quality, Regional development, *Salinity, *Eutrophication, Water temperature, Limnology, *Colorado River, *Model studies, Arizona, Dissolved oxygen, Nitrates, Phosphates, Phytoplankton, Dissolved solids, Ecosystem, *Energy budget, Thermal stratification, Ion exchange, Sediments.
Identifiers: *Chemical-ion models.

This research was designed to assemble and analyze available data on chemical quality and limnology of reservoirs and river reaches from Lee Ferry to Imperial Dam, to determine the effects of development on salinity and to initiate the validation of models of interaction of chemical ions, sediments, biological factors and other limnological inputs such as thermal stratification and turnover. The study has completed a biological and chemical review of the Lower Colorado River, a statistical and stochastic eutrophication model, an energy-budget model, a cross-spectral analysis salinity model and shown the applicability of remote sensing of water quality. A specific chemical-ion model and aquatic ecosystem model to incorporate the above sub-models is under development.
W73-14756

LOCATION, IDENTIFICATION, AND CHARACTERIZATION OF PATHOGENS OF THE WATER HYACINTH,
Florida Univ., Gainesville. Dept. of Plants Pathology.
R. E. Rintz.
Available from the National Technical Information Service as PB-223 868, $5.25 in paper copy, $1.45 in microfiche. PhD Dissertation, 1973. 53 p, 8 fig, 2 tab, 56 ref. OWRR B-011-FLA (7). 14-31-0001-3268.

Descriptors: *Plant pathology, *Biocontrol, *Water hyacinth, Aquatic weeds, Florida, Louisiana, Panama, Puerto Rice, *Pathogenic fungi, Isolation, *Aquatic weed control.
Identifiers: *Rhizoctonia solani.

Surveys were conducted in Florida, Louisiana, Panama, and Puerto Rico to determine the nature and extent of diseases occurring on water hyacinth (Eichhornia crassipes). Approximately 400 microbial isolates were inoculated onto water hyacinth leaves and seven fungi produced significant lesions. Rhizoctonia solani was the most virulent pathogen isolated and it caused extensive lesions on aerial parts of the plant. Since it did not appear to be affecting other vegetation in those areas surveyed, its potential as a biocontrol agent should be further investigated. Cephalosporium zonatum was a less virulent pathogen but had a wide host range under artificial inoculation. It was shown to be identical to C. eichhorniae and C. fici on the basis of culture morphology and pathogenicity. Fusarium roseum was shown to produce metabolites causing vascular browning in water hyacinth leaves, but it proved to be a weak pathogen. Nigrospora sphaerica, Apiocarpella sp., Curvularia lunata, and Pestalotia sp. were minor pathogens which had not been previously reported on water hyacinth. A lethal disease of anchoring hyacinth (E. azurea) was found in Panama but was not identified. (Morgan-Florida)
W73-14758

THE EFFECTS OF DIFFERENTLY EXTRACTED ENDOTOXINS FROM ESCHERICHIA COLI ON RAINBOW TROUT (SALMO GAIRDNERI),
Providence Coll., R.I. Dept. of Biology.
G. P. O'Leary, Jr.
Available from the National Technical Information Service as PB-223 910, $2.75 in paper copy, $1.45 in microfiche. Rhode Island Water Resources Center, Providence, Completion Report, 1973, 20 p, 4 tab, 20 ref. OWRR A-039-RI (1). 14-31-0001-3840.

Descriptors: *E. coli, *Rainbow trout, Water pollution effects, *Toxicity, Bacteria, Lethal limit, Laboratory tests, *Pathogenic bacteria.
Identifiers: *Endotoxin, Lipopolysaccharide.

A laboratory study on the possible lethal effects of Escherichia coli endotoxin on rainbow trout was conducted. The investigation was conducted using endotoxin extracted from Escherichia coli by four different chemical means. The endotoxin was obtained by four mild extraction methods (ethylenediamine-tetraacetic acid (EDTA) water, trichloracetic acid, and aqueous ether) in order to more closely approximate the endotoxin naturally released by E. coli during its natural growth cycle. The endotoxin preparations were administered to the trout by introperitoneal injections in an aqueous solution. Results have shown that endotoxin extracted using EDTA caused death in the trout at concentrations of approximately 410.88 mg per Kg. body weight and 207.16 mg/Kg. body weight. Ether extracted endotoxin also was capable of causing death in trout in two to thirteen days at lower concentrations ranging from an average value of 154.62 mg/Kg. body weight to 207.23 mg/Kg. body weight. Death seems to occur more rapidly with increased endotoxin and with the use of small (younger) trout.
W73-14769

VEGETATION OF THE LAKE IPEA REGION, NEW GUINEA HIGHLANDS: II. KAYAMANDA SWAMP,
Australian National Univ., Canberra. Research School of Pacific Studies.
For primary bibliographic entry see Field 02H.
W73-14856

EFFECTS OF THERMAL DISCHARGES UPON THE CHENA RIVER,
Alaska Univ., College. Inst. of Water Resources.

Available from the National Technical Information Service as PB-224 015, $9.50 in paper copy, $1.45 in microfiche. M.S. Thesis, April, 1973, 131 p, 32 fig, 14 tab. OWRR B-020-ALAS (2).

Descriptors: *Thermal pollution, *Ice cover, Cooling water, *Alaska, Cold regions, Subarctic, *Ice fog, *Jets, Dispersion, Outlets, Discharge (Water), Diffusion.
Identifiers: Fairbanks (Alas), *Chena River (Alas).

The evaluation of several thermal discharges in Fairbanks, Alaska was carried out to determine their effects on the physical parameters of the Chena River, a typical sub-Arctic stream. In addition, the effectiveness of two discharge schemes at the main thermal source was compared. The use of a surface-spreading scheme at either source would result in a heat dissipation rate per unit area 2 to 10 times greater than use of a submerged jet. The amount of ice cover downstream from the discharges would be approximately 40% more using the submerged jet. The advantages of each discharge method are discussed and two alternative cooling methods are suggested. (Carlson-Alaska)
W73-14864

THE SIGNIFICANCE OF SELECTED PHYSICAL AND CHEMICAL VARIABLES IN BENTHIC MACROINVERTEBRATE DISTRIBUTION IN A SMALL SUBARCTIC STREAM,
Alaska Univ., College. Inst. of Water Resources.
D. L. Ward.
Available from the National Technical Information Service as PB-224 055, $3.50 in paper copy, $1.45 in microfiche. M.S. Thesis 1972, 62 p, 10 tab, 12 fig, 85 ref. OWRR B-017-ALAS (2).

Descriptors: Streams, *Benthos, Physical properties, Subarctic, *Alaska, Velocity, *Mayflies, *Caddisflies, Aquatic insects, Stoneflies, Temperature, *Dissolved oxygen, Hydrogen ion concentration, Distribution patterns.
Identifiers: *Goldstream Creek (Alas).

The objective was to determine whether temperature, velocity, dissolved oxygen, or pH operate singly, synergistically, or additionally, to control or limit distribution of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera, (caddisflies), in Goldstream Creek. Ephemeroptera, Trichoptera and Plecoptera composed 90.8%, 9.1% and 0.1% of the total number of organisms collected during the sampling period. Only fourteen stoneflies were sampled and this proved to be too small a number from which to draw any conclusions. Trichopterans occurred in highest numbers in areas not heavily populated with Ephemeroptera. The station where the largest total number of caddisflies were collected had the highest water velocity and was the furthest downstream station. Normal downstream changes in water quality such as increased temperature, solids, color and turbidity, and decreased dissolved oxygen are also suspected to influence this separation of the mayflies and caddisflies. At the station with highest water velocity the caddisflies distributed themselves so that the numbers collected were inversely related to water velocity. Thus, the water velocity-caddisfly number relationship found was complex. Further research is recommended on the influence of low dissolved oxygen on the macroinvertebrate benthos as the dissolved oxygen level in this stream often falls as low as 0.5 mg/l or less during the winter. (LaPerriere-Alaska)
W73-14865

THE DRIFT OF BENTHIC INVERTEBRATES IN GOLDSTREAM CREEK, ALASKA,
Alaska Univ., College. Inst. of Water Resources.
J. R. Clay.
Available from the National Technical Information Service as PB-224 009, $6.75 in paper copy, $1.45 in microfiche. M.S. Thesis 1973, 83 p, 10 fig, 5 tab, 51 ref. OWRR B-017-ALAS (3).

Descriptors: Benthos, *Aquatic drift, *Diptera, Ephemeroptera, Physical properties, *Alaska, Subarctic, *Mayflies, Caddisflies, Water temperature, *Diurnal distribution, Light, Discharge (Water).
Identifiers: *Goldstream Creek (Alas).

The objectives were to determine if there was any diurnal variation in the amount of drift; what organisms were present in the drift; and to evaluate several physical parameters, including light intensity, water temperature and stream discharge with respect to their influence on the drift of macro-invertebrates in Goldstream Creek. Ephemeroptera (Mayflies) and Diptera (two-winged flies) were the only orders represented consistently within the drift. Ephemeroptera exhibited a definite diurnal periodicity during the second, third and fourth (of four) sampling periods, while Diptera exhibited a similar periodicity during the third and fourth sampling days. Both orders peaked in abundance, as caught with a drift net, after sunset. The greatest numbers of both orders captured during the study were collected on the sampling day during which the highest water temperature was measured.
W73-14866

THE EFFECT OF THERMAL INPUTS ON THE POPULATIONS OF FISH AND MACROINVERTEBRATES IN THE WABASH RIVER,
DePauw Univ., Greencastle, Ind.
J. R. Gammon.
Available from the National Technical Information Service as PB-224 056, $4.25 in paper copy, $1.45 in microfiche. Purdue University Water Resources Research Center, Lafayette, Indiana, Technical Report No. 32. 1973. 106 p, 45 fig, 9 tab, 27 ref. OWRR B-031-IND (4).

Descriptors: *Fish populations, *Fish migration, *Electric powerplants, *Water temperature, Electric shocking gear, Nets, Catfish, Sauger, Suckers, Bass, Fish harvest, Fish reproduction, Thermal powerplants, Thermal water, Warm-water fish, *Indiana, Thermal pollution, *Invertebrates, Thermocline, Distribution patterns, Fish behavior.
Identifiers: *Wabash River (Ind), Redhorse species, Wabash Station, Cayuga Station.

The distribution of fish and macroinvertebrate populations near two electrical generating stations located on the Wabash River were examined during the summer and early fall for six years. Segments of the river were subdivided into zones corresponding to the imposed thermal conditions and to different kinds of habitat. Fish responded readily to changing thermal conditions and concentrated in areas of the river which provided temperature close to their optimum. Although most species reacted behaviourally to the alterned thermal conditions, only two groups appeared to be affected permanently as populations. Flathead catfish (pylodictis Olivaris) responded to higher temperatures with enhanced reproductive success which increased population density two or three times. Redhorse (moxostoma erythrurum and M. breviceps) are more thermally sensitive and population densities are likely to be reduced with higher temperatures. Complicating factors include the fact that several species of fish, including redhorse and sauger (Stizostedion canadense), appear to rely upon recruitment from tributaries to sustain the mainstem populations. Long-term changes in the density of other species were not detected. (Wiersma-Purdue)
W73-14869

EFFECTS OF TEMPERATURE, RATION, AND SIZE ON THE GROWTH OF JUVENILE STEELHEAD TROUT, SALMO GAIRDNERI,
Oregon State Univ., Corvallis.

Wayne A. Wurtsbaugh.
Available from the National Technical Information Service as PB-224 016, $6.75 in paper copy, $1.45 in microfiche. MS Thesis, June 1973. 69 p. B-027-ORE. 14-31-0001-3633.

Descriptors: Stream temperature effects, Fish studies, Trout, Temperature effects.
Identifiers: Thermal pollution.

The effects of temperature, temperature fluctuation, and fish size on the growth of juvenile steelhead trout (Salmo gairdneri) were studied in experiments which lasted 10-25 days. Groups of fish were fed at ration levels varying from near-starvation to repletion. Decelerating, curvilinear relationships between rates of food consumption and growth were defined in most of the experiments. At ration levels near maintenance, temperatures raised 3-6 C above the seasonal ambient temperatures decreased the growth of the trout. As feeding rate increased, the detrimental effect of temperature on growth was ameliorated. At repletion feeding levels, elevation of temperature up to about 17C increased trout growth by increasing the maximum food consumption rates of the fish. Large daily temperature fluctuations of 4-8C did not increase growth rates and in some cases decreased growth rates to levels below those of fish kept at constant temperatures. Periodic sampling of steelhead trout indicated that growth rates of wild trout ranged from -0.18 to 1.6% day. Food consumption rates of wild trout were estimated to range from 2 - 7.6% day; considerably less than the maximum consumption rates of laboratory fish. At these food consumption rates it is estimated that stream temperature increases above normal would decrease growth rates of wild steelhead trout.
W73-14873

GROWTH AND FOOD CONSUMPTION OF JUVENILE COHO SALMON EXPOSED TO NATURAL AND ELEVATED FLUCTUATING TEMPERATURES,
Oregon State Univ., Corvallis.
Larry B. Everson.
Available from the National Technical Information Service as PB-224 059, $6.25 in paper copy, $1.45 in microfiche. MS Thesis, June 1973. B-027-ORE. 14-31-0001-3633.

Descriptors: Stream temperature effects, Fish studies, Salmon, Temperature.
Identifiers: Thermal pollution.

Relationships between rates of food consumption, growth and food assimilation of juvenile coho salmon were determined for different experimental temperature conditions during the short-term, 30-day experiments. The efficiency of food assimilation was determined by measuring the quantities of food consumed and the amounts of fecal wastes produced. Concurrent long-term studies were conducted over four and eight-month periods under similar temperature conditions. Growth rates of salmon at equivalent ration levels were compared between the short and long-term experiments. The growth rates of control fish were generally greater than those of fish exposed to elevated temperatures for each of the five short-term experiments. Increased rations ameliorated the effects of elevated temperatures on growth rates. The results of the study suggest that temperature criteria for juvenile coho derived from measurements based upon constant temperatures may not be satisfactory for protecting the fish during the extended period of their freshwater existence. Measurements of salmon growth during long-term experiments indicated that any substantial increases of temperature would result in a reduction in the size of smolts. Significant reductions of growth resulting from higher temperatures could influence the production of salmon populations through decreased marine survival.
W73-14874

EUTROPHICATION OF SHELTERED BAYS IN A LARGE LAKE,
Utah Center for Water Resources Research, Logan.
W. T. Helm.
Available from the National Technical Information Service as PB-224 060, $3.75 in paper copy, $1.45 in microfiche. Final Report (1972). 80 p, 12 fig, 18 tab, 52 ref. OWRR B-056-UTAH (1).

Descriptors: *Eutrophication, *Harbors, *Lakes, *Breakwaters, *Currents (Water), Utah, Idaho, Bottom sampling, Water chemistry, Aquatic plants, Benthic fauna, Invertebrates, Sediments, Shore, Ecological distribution, Coliforms, Silts, Clays, Organic matter, Dissolved oxygen, Diptera, Environmental gradient.
Identifiers: Effects of breakwaters, *Bear Lake (Utah-Idaho).

Wether undesirable changes occur in bays, expecially those formed by breakwaters, was studied in Bear Lake, Utah-Idaho. The quantity of influent water was measured, the differences in quality in the bay from the lake determined, and a comparative study of any measurable biological responses possibly related to differences in water quality made. Measured water chemistry parameters did not differ from one location to another in Bear Lake. Coliform bacteria appeared concentrated on shore side of breakwaters as a result of water currents. Organic matter varied inversely with depth. Amounts of silt-clay were greatest in protected areas. Dissolved oxygen in near-bottom water varied inversely with both organic matter and temperature. Transects in protected areas had a greater average aquatic macrophyte occupancy than transects in exposed areas and plants were taller in protected areas. Chironomid numbers and distributions were influenced by silt-clay, organic matter, dissolved oxygen, and degree of protection from currents. Sheltered areas, protected by bays or breakwaters, contained conditions more favorable for development of vegetation and populations of some chironomid species than areas exposed to full force of water currents. There is an apparent annual eutrophication cycle in sheltered bays. (Jones-Wisconsin)
W73-14875

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME I, SUMMARY REPORT,
California State Dept. of Water Resources, Sacramento.
R. L. Brown, and L. A. Beck.
October 1972. 94 p, 22 fig, 8 tab, 26 ref, 1 append.

Descriptors: *Toxicity, *Eutrophication, *Water pollution effects, *Water pollution control, *California, Waste treatment, Standards, Water quality, Bioassay, Biota, Algae, Wastes, Fish, Effluents, Dispersion, Statistical methods, Estuaries, Benthos, Outlets, Dispersion, Regression analysis, Municipal wastes, Chlorination, Industrial wastes, Indicators.
Identifiers: *San Francisco Bay-Delta (Calif.), Species diversity index.

Studies on toxicity and biostimulation in San Francisco Bay-Delta waters for information on use of estimated in situ toxicity concentration as a waste management criterion are summarized. Toxicity of municipal wastes can be effectively reduced by biological treatment or by a combination of physical-chemical processes. Industrial waste toxicity certainly can be lowered by appropriate treatment, but treatment processes tailored to remove specific toxicants would probably be preferable to more generalized processes. Benthic species diversity is at least a rough idea of the health of aquatic biological communities while fish populations are rather difficult to sample quantitatively. In spite of taxonomy difficulties in obtaining benthic community diversity indices, they are probably more informative in evaluating pollution effect and are easier to obtain than similar indices for fish populations. Another approach to determine community health was the artificial substrate or aufwuchs community bioassays. These assays can be used as direct indicators without requiring complete identification of colonizing organisms. A toxicity objective of 0.04 toxic unit is based on relationships derived from stickleback acute toxicity bioassay data. (See W73-14877 thru W73-14881) (Jones-Wisconsin)
W73-14876

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WASTERS, VOLUME II, A STATISTICAL EVALUATION OF THE RELATIONSHIP BETWEEN TOXICITY AND SPECIES DIVERSITY INDEX.
Hydroscience, Inc., Westwood, N.J.

California Department of Water Resources, Sacramento, November 1972. 249 p, 83 fig, 21 tab, 20 ref, 3 append.

Descriptors: *Wastes, *Bioindicators, *Toxicity, *Biota, *Statistical methods, Regression analysis, *California, Benthic fauna, Plankton, Microorganisms, Zooplankton, Methodology, Municipal wastes, Industrial wastes, Bioassay, Fish, Estuaries.
Identifiers: *Species diversity index, *San Francisco Bay-Delta (Calif.).

Methods and results of a statistical reevaluation of data collected during the University of California Comprehensive Study of San Francisco Bay, 1960-1964 are described. Significant correlations between species diversity indices and relative toxicity are quantitatively defined. Results of the analysis are presented in the form of regression equations which indicate intercorrelations between diversity indices, relative toxicity, and other water quality factors. Results are presented for benthic animal, microplankton, and zooplankton species diversity indices. Toxicity concept is derived from correlations between wastewater strength and its toxic effects on marine flora and fauna. Acute waste toxicity is determined by a 48- or 96-hour static or continuous flow bioassay test, depending on definition. Test organisms may vary, but a fish species (stickleback) is most commonly used. The Margalef Diversity Index employed is a measure of the flora or fauna species diversity in a sample. These results suggest that calculated conservative relative toxicity can be considered as a candidate variable for use in a regulatory policy. It may be difficult to determine if a waste management program is effective with the use of a benthic species diversity index as a criterion of a biotic health. (See also W73-14876) (Jones-Wisconsin)
W73-14877

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME III, ACUTE TOXICITY OF DISCHARGED WASTES,
California State Dept. of Fish and Game, Sacramento.
D. C. Wilson, and C. R. Hazel.
Prepared for California Water Resources Control Board, Sacramento, October 1971. 113 p, 6 fig, 25 tab, 20 ref, 2 append.

Descriptors: *Toxicity, *Biological communities, *Bioassay, *Industrial wastes, *Municipal wastes, Fish, Estuaries, *California, Measurement, Effluents, Phenols, Lethal limit, Food processing industry, Oil wastes, Organic compounds, Pulp wastes, Chemical wastes, Lead, Methodology, Benthic fauna.
Identifiers: *Biostimulation, *San Francisco Bay (Calif.), San Pablo Bay (Calif.), Tolerance limit, Sub-lethal effects, San Joaquin River (Calif.).

Static and continuous-flow bioassays were used to determine 96-hour acute toxicities of selected municipal and industrial wastes to several fish and invertebrate species. Mass acute toxicity emission rates are given relative to variations in flow, waste strength, and species sensitivity. Special studies included acute toxicity bioassays to define the relationship between salinity and sensitivity of fish to phenol, parallel static and continuous-flow bioassays for comparative purposes, and a sublethal response bioassay conducted to relate differences in growth and food consumption to waste concentration. In comparing continuous-flow and static bioassay of municipal and industrial wastes, the 96-hour static bioassay of composite samples of an unchlorinated municipal waste renewed daily is sufficient to estimate the acute toxicity threshold level; chlorinated municipal wastes should be tested using in-line continuous-flow 96-hour bioassay; industrial effluents should be tested using in-line continuous-flow bioassay systems for a minimum of 96-hours for 7 to 14 days as necessary. The 96-hour Median Tolerance Limit values are given for municipal (primary chlorinated, secondary chlorinated, secondary unchlorinated) and industrial wastes. The array of test species used was sufficiently sensitive to demonstrate toxicity of all wastes tested in continuous-flow bioassay. (See also W73-14876) (Jones-Wisconsin)
W73-14878

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME VI, BIOASSAYS OF LOWER TROPHIC LEVELS,
California Univ., Berkeley. Sanitary Engineering Research Lab.; and California Univ., Berkeley. School of Public Health.
H-J. Krock, and D. T. Mason.
Prepared for California Water Resources Control Board, Sacramento. SERL Report No. 71-8, October 1971. 123 p, 52 fig, 12 tab, 86 ref.

Descriptors: *Eutrophication, *Bioassay, *Trophic level, *Toxins, Phosphates, Nitrites, Biological communities, Photosynthesis, Respiration, Plankton, Bicarbonates, *California, Measurement, Copper, Mercury, Water pollution effects, Sewage effluents, Sewage treatment, Water pollution sources, Bays, Estuaries, Periphyton, Chlorine, Food webs, Balance of nature.
Identifiers: *San Francisco Bay-Delta (Calif.).

Bioassay methods measuring toxicant and stimulant effects on native organism communities were developed and applied. One method employed organisms settling and growing on artificial substrates (aufwuchs communities), response measurements being photosynthetic rate changes. Another used photosynthesis rate of native plankton indicated by C-14 labeled bicarbonate uptake rates. Effects of known toxicants and possible stimulants and of sewage with various degrees of treatment on supporting trophic levels of San Francisco Bay were evaluated. Short-term metabolic responses of test communities to a perturbation were compared with long-term growth response of communities subjected to similar perturbations. Copper and mercury are probably now stressing lower trophic level organisms in central San Francisco Bay. Simple organic compounds probably stimulate aufwuchs photosynthesis indirectly. Municipal sewage primary effluent stimulated aufwuchs photosynthesis at concentrations 5 to 10% and depressed photosynthesis at greater concentrations. Biological secondary treatment with activated sludge and tertiary treatment with lime precipitation and recarbonation and ammonia removal by ion exchange reduced stimulation of respiration and photosynthesis inhibition. Combined chlorine residual in domestic sewage effluent depressed all metabolic functions measured. Chlorinated effluent was found to inhibit growth while low concentrations of unchlorinated effluent stimulated growth. (See also W73-14876) (Jones-Wisconsin)
W73-14879

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME VII, EFFECTS OF SELECTED WASTE DISCHARGES ON BENTHIC INVERTEBRATE COMMUNITIES,
California State Dept. of Fish and Game, Sacramento.
D. A. Daniel, and H. K. Chadwick.
Prepared for California Water Resources Control Board, Sacramento, October 1971. 153 p, 33 fig, 2 tab, 15 ref, 18 append.

Descriptors: *Benthos, *Toxicity, *Wastes, *Water pollution effects, Invertebrates, *California, Effluents, Biological communities, Bio-indicators, Estuaries, Water quality, Municipal wastes, Industrial wastes, Dispersion, Bioassay, Fish, Sampling, Speciation.
Identifiers: *San Francisco Bay (Calif.), Suisan Bay (Calif.), San Pablo Bay (Calif.), San Joaquin River (Calif.), Biological diversity, Waste dispersion.

The basic approach was to select waste discharges with dispersion zones in which waste concentrations could be defined and in which waste toxicity would be the primary variable potentially affecting benthic invertebrates. Abundance of individual invertebrate species and community diversity were measured at points covering the range of waste concentrations present. Observed trends in community characteristics were then compared with toxicity concentration calculated from acute toxicity bioassays on fish, conducted in another portion of the study. The observed effects on benthic invertebrate communities were apparently principally caused by the toxic character of the wastes. Diversity and numbers of benthic invertebrates were inversely related to waste concentration, with the exception of a direct relationship in diversity at San Leandro. The similarity of communities during two sampling periods indicate that the communities integrate environmental effects over a considerable period of time; this is valuable in evaluating long-term effects of pollution, but has limited value in evaluating short-term effects. Diversity, numbers and individual species distribution should all be considered in evaluating benthic invertebrate communities. Great care must be taken to establish the correct identification of all specimens. (See also W73-14876) (Jones-Wisconsin)
W73-14880

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WATERS, VOLUME VIII, ALGAL ASSAYS OF SELECTED WASTE DISCHARGES,
California State Dept. of Water Resources, Sacramento.
R. L. Brown, and G. Varney.
Prepared for California Water Resources Control Board, Sacramento, October 1971. 59 p, 14 fig, 10 tab, 17 ref, (append; x-Review of Biostimulation, by H. K. Chadwick).

Descriptors: *Algae, *Bioassay, *Wastes, *Toxicity, *Eutrophication, Biological communities, *California, Methodology, Sewage effluents, Plant growth, Oil wastes, Municipal wastes, Trace elements, Industrial wastes.
Identifiers: *San Francisco Bay-Delta (Calif.).

In further evaluating overall toxicity and biostimulation, data were obtained on the biostimulatory nature of some selected waste discharges with the added goal of evaluating available algal assay procedures. Laboratory batch algal assays were conducted using wastes from six San Francisco Bay area discharges (four municipal and two refinery effluents). One of the refinery wastes was assayed using three suggested algal assay methods concurrently--batch test, chemostat continuous flow, and in situ. Results of batch assays of municipal wastes indicate that addition of unchlorinated wastes caused increased algal growth in laboratory cultures. The two refinery effluents tested caused different algal growth responses in laboratory cultures which could be attributed to differences in nutrient concentrations. Application of the laboratory data to growth conditions in the Bay is difficult. The assay method selected will depend on type of biostimulation study. Laboratory batch tests can be used for screening purposes; continuous flow assays can be used to determine the constants in the kinetic growth equation; and the in situ tests approximate more closely natural conditions of light and temperature. All but one of the wastes examined had the theoretical potential to cause increased algal growth. (See also W73-14876) (Jones-Wisconsin)
W73-14881

THE DETECTION OF A BOUND FERREDOXIN IN THE PHOTOSYNTHETIC LAMELLAE OF BLUE-GREEN ALGAE AND OTHER OXYGEN EVOLVING PHOTOSYNTHETIC ORGANISMS,
King's Coll., London (England). Dept. of Botany.
M. C. W. Evans, S. G. Reeves, and A. Telfer.
Biochemical and Biophysical Research Communication, Vol 51, No 3, p 593-596, 1973. 2 fig, 7 ref.

Descriptors: *Biochemistry, *Photosynthesis, *Cyanophyta, Chlorophyta, Anabaena, Euglena, Beans, Sorghum, Spectroscopy, Chlorella.
Identifiers: *Electron acceptor, Electron transport, Ferrodoxin, Chloroplasts, Anabaena cylindrica, Euglena gracilis, Phaseolus vulgaris, Sorghum bicolour, Chlorella vulgaris.

A chloroplast component with an electron paramagnetic resonance (EPR) spectrum similar to that of ferredoxin is photoreduced at 77 Kelvin or lower temperatures in spinach chloroplasts. It has been proposed that this component is the primary electron acceptor of photosystem I. Lamellar particles were prepared from the blue-green alga Anabaena cylindrica. Chloroplasts were prepared from Euglena gracilis and from 14-day old greenhouse grown beans (Phaseolus vulgaris) and from greenhouse grown sorghum (Sorghum bicolour). Samples for EPR spectroscopy were prepared and the spectra obtained using a Varian E4 spectrometer. The presence of an electron transport component was demonstrated in all four preparations. Similar signals have been observed in chloroplasts from Euglena gracilis and whole cells of Chlorella vulgaris, although the signals are very small and difficult to observe in these organisms. The presence of a bound ferredoxin in the photosynthetic lamellae of such a diverse group of organisms, and the demonstration that in all these organisms the ferredoxin can be photoreduced at 77 Kelvin, is strong supporting evidence for the proposal that this ferredoxin is the primary acceptor of electrons in the photosynthetic electron transport system of all oxygen evolving organisms. (Jones-Wisconsin)
W73-14882

DIFFERENTIAL RESPONSES OF MARINE PHYTOPLANKTON TO HERBICIDES: OXYGEN EVOLUTION,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
T. A. Hollister, and G. E. Walsh.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 5, p 291-295, 1973. 2 tab, 7 ref.

Descriptors: *Pesticide kinetics, *Marine algae, *Herbicides, Fungicides, Ureas, Triazine pesticides, Chlorinated hydrocarbon pesticides, Inhibition, *Pesticide toxicity, *Phytoplankton, Chlorophyta, Chrysophyta, Organophosphorus pesticides, Rhodophyta, Bioassay, Lethal limit.
Identifiers: *Oxygen evolution, Pesticide effects, Neburon, Diuron, Atrazine, Ametryne.

The varying responses of marine unicellular algae to herbicides are described. Eighteen species were tested against the substituted ureas, neburon and diuron, and the triazines, atrazine and ametryne. Effects of herbicides were measured as inhibition of oxygen evolution. Both ureas and triazines inhibit photosynthesis and move quickly into the cells and the concentrations required for inhibition of both growth and photosynthesis are the same. Species of the family Bacillariophyceae were generally the least sensitive, requiring as much as 5.8 times more ametryne to reduce oxygen evolution by 50% than did species of the other families. All data were subjected to statistical analysis. Wide variations occurred in response to the toxicants among the individual species of the families Chlorophyceae, Bacillariophyceae, and Chrysophyceae. In bioassay analyses conducted for effects of herbicides on marine unicellular algae, two factors are particularly important: response in relation to familial taxonomic position, and wide range of response by individual species within a given family. It is necessary, therefore, to use several species from each of several families in algal bioassay studies to obtain realistic data concerning herbicidal effects on algae. (Jones-Wisconsin)
W73-14883

EFFECTS OF NUTRIENT ENRICHMENT AND A ROUGH FISH POPULATION (CARP) ON A GAME FISH POPULATION (SMALLMOUTH BASS),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
T. A. Haines.
Transactions of the American Fisheries Society, Vol 102, No 2, p 346-354, 1973. 6 fig, 6 tab, 28 ref.

Descriptors: *Fish populations, *Eutrophication, *Fertilization, Sport fish, Carp, *Bass, Nitrogen, Phosphorus, Growth rates, Productivity, Spawning, Nutrients.

Decline of game fish may be due to physical, environmental changes, to interference from rough fish, better adapted to enriched conditions, or to some combination of these factors. To test effects of nutrient enrichment and a rough fish population, (Cyprinus carpio), on a game fish population (Micropterus dolomieui), individually and in combination, two fertility levels (low and high) were established in a series of artificial ponds. Low fertility ponds were undisturbed, while nitrogen and phosphorus were added once every two weeks to high fertility ponds. Replicates of three fish population types were established at each fertility level: game fish only, rough fish only, and game and rough fish in combination. Growth rate recorded after 15 months was used as an index of the status of the fish populations. High and low fertility ponds differed in nutrient concentrations, oxygen level, amount of food organisms, turbidity, and temperature. Bass growth rate in high fertility ponds was significantly lower than in low fertility ponds; carp growth rate in high fertility ponds was significantly higher than in low fertility ponds. Nutrient enrichment was detrimental to smallmouth bass and beneficial to carp. The two populations combined did not affect each other. (Jones-Wisconsin)
W73-14885

CONTROL OF RESERVOIR EUTROPHICATION,
Fairfax County Water Authority, Annandale, Va.
For primary bibliographic entry see Field 05G.
W73-14886

NEW AND RARE AQUATIC FUNGAL SPECIES ISOLATED FROM STOCK PONDS IN THE LENINGRAD REGION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
I. A. Dudka, and A. A. Florinskaya.
Mikol Fitopathol Vol 5, No 5, p 431-438, 1971. Illus.
Identifiers: *Pathogenic fungi, Achlya-flagellata, Achlya-klebsiana, Anguillospora-longissima, *Aquatic fungi, Camposporium-aquaticum, Lemonniera-aquatica, *Leningrad, Ponds, Records, Saprolegnia-delica, Saprolegnia-mixta, Saprolegnia-monoica-var-floccosa, Tetracladium-marchalianum, Tricladium-angulatum.

In the search for fungi as pathogenic agents of fishes and spawn, 10 spp. of aquatic fungi were isolated. Five of these were Phycomycetes which have not been noticed earlier in the Leningrad region. The other five are Fungi Imperfecti found once earlier in water basins that were not used for fishbreeding. Descriptions of the following aqueous fungi are presented: Saprolegnia monoica Pringsh. var. floccosa (Maur.) Cejp., S. mixta d By., S. delica Coker, Achlya klebsiana Pieters., A. flagellata Coker., Anguillospora longissima (Sacc. et Syd.) Ing., Camposporium aquaticum Dudka., Lemonniera aquatica de Wild., Tricladium angulatum Ing. and Tetracladium marchalianum de Wild.--Copyright 1973, Biological Abstracts, Inc.
W73-14887

THE EFFECTS OF HARVESTING AQUATIC MACROPHYTES ON ALGAE,
Wisconsin Univ., Madison.
S. A. Nichols.
Wisconsin Academy of Sciences, Arts and Letters, Vol 61, p 165-173, 1973. 3 fig, 2 tab, 10 ref.

Descriptors: *Harvesting, *Aquatic weed control, *Algae, *Wisconsin, Productivity, Depth, Management, Shallow water, Competition.
Identifiers: *Lake Mendota (Wis.), Antagonistic relationship, Water milfoil.

To determine whether control of aquatic macrophytes by harvesting would lead to increased algal production, both long and short term effects of harvesting were studied over three years in University Bay of Lake Mendota, Wisconsin, in one shallow water area, uniformly 1 m deep (inside a sandbar), and another 1.0 - 1.6 m deep (outside the sandbar). At the middle of each month, prior to each harvest, two random, 1 sq m samples were taken from appropriate harvested and control areas. Macrophytes and filamentous algae were collected and dry weight obtained for each. A significant increase in algal biomass was found 1 year after 2 years of harvesting, in shallow water areas (depth 1 m). This increase was concomitant with a decrease in macrophytes. In the deeper water (average depth 1.3 m) a drop in macrophyte biomass was accompanied by a drop in algal biomass. Productivity differences were also found between shallow and deep water areas. In deep water, peak productivity for algae and macrophytes occurred at nearly the same time. Peak macrophyte productivity was accompanied by low algal productivity in shallow water. (Jones-Wisconsin)
W73-14888

EUTROPHICATION CONTROL: NUTRIENT INACTIVATION BY CHEMICAL PRECIPITATION AT HORSESHOE LAKE, WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05G.
W73-14889

LIMNOLOGICAL STUDIES ON SOME LAKES IN THE NETHERLANDS: I. A LIMNOLOGICAL RECONNAISSANCE AND PRIMARY PRODUCTION OF WIJDE BLIK, AN ARTIFICIALLY DEEPENED LAKE,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
R. D. Gulati.
Freshwater Biol. Vol 2, No 1, p 37-54, 1972.
Identifiers: Bosmina-coregoni, Copepoda, Desmids, Diatoma-elongatum, Lakes, Limnological studies, Microcystis, *Netherlands (Wijde-blik), Plankton, *Primary production, Reconnaissance, Wijde-blik, *Zooplankton.

Most Dutch lakes are small and shallow, resulting from peat dredging since the late 18th century. However, deep lakes have appeared recently owing to sand digging. Limnological features of one such lake, Wijde Blik (N Holland), were studied during 1968-70. The lake is one of the deepest and biggest in the Loosdrecht-lakes area. The lake is 125 cm below sea level, and underground water movements play an important part in the lake's hydrology. The lake exhibits thermal stratification on warm and calm days; since the lake surroundings are open and flat, wind and nocturnal cooling destroy such a stratification. There is continuous circulation from autumn through spring. The O2 saturation (%) in the upper water varies from 70 to 120%. Bottom waters were never anaerobic (lowest values 10% O2 saturation). Cl- and HCO3 were dominant anions just as Ca++ and Na+ formed the main cations. Chlorides have increased 2.5-fold in the 40 yr as a geochemical consequence of deepening. The surface drainage has minor influence on lake's water chemistry. The SiO2-Si decreased from February 1969 to June 1969 as Diatoma elongatum increased. Chlorococcales were the important lake algae. Desmids were poor. Microcystis dominated from July-September, achieving from 15 to 31 colonies/ml. Poor light transmission rather than nutrients limits plankton growth and primary production in the lake. Copepoda were the dominant zooplankton. Bosmina coregoni recorded between 2 and 44 individuals/l in summer 1968 and was the main cladoceran.--Copyright 1973, Biological Abstracts, Inc.
W73-14890

PHOSPHORUS FLUX ACROSS A CORAL REEF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05B.
W73-14892

TOXIC EFFECTS OF COLOR PHOTOGRAPHIC PROCESSING WASTES ON BIOLOGICAL SYSTEMS,
Environmental Health Lab., Kelly AFB, Tex.
E. E. LeFebvre, and R. A. Callahan.
Available from the National Technical Information Service as AD-753 663, $3.00 in paper copy, $1.45 in microfiche. Technical Report EHL (K) 70-9, August 1970. 101 p, 25 fig, 20 tab, 17 ref. 69-10.

Descriptors: *Water pollution sources, *Toxicity, *Sewage bacteria, *Photography, Biological communities, Chemicals, Toxins, Waste water disposal, Activated sludge, Degradation (Decomposition), Industrial wastes, Bioassay.
Identifiers: *Photographic wastes, Kodak EA-4, Kodak Ektachrome RT Processor, Silver.

Photographic chemicals generated by the Kodak Ektachrome RT Process using Kodak EA-4 processing chemicals were tested for toxicity to Daphnia magna (water flea) and Pimephales promelas (fathead minnow) and toxicity to and degradability by sewage treatment microorganisms. Desilvered waste is successfully degraded by and is non-toxic to sewage organisms at concentrations as high as 0.05% chemical waste. The toxicity data of the individual baths were used to predict highest concentration of combined waste that would be non-toxic to microorganisms. Desilvering the fixing baths allowed 0.2% composited EA-4 waste to be successfully treated by activated sludge plants. Extreme toxicity of non-desivered EA-4 waste to activated sludge organisms is caused by accumulation of silver in the sludge. Under no circumstances may the untreated EA-4

bleach be safely released into streams. An unknown amount of iron cyanides and thiocyanates (less than 3.5 mg/l assuming good plant performance) will be present in the effluent. Subsequent chlorination and sunlight action may result in substantial conversion of the chemicals to highly toxic cyanide compounds. This a 10-fold dilution of the treatment plant effluent (preferably 100-fold) is necessary for any treatment plant routinely containing EA-4. (Jones-Wisconsin)
W73-14893

SUBLETHAL EFFECTS OF CRUDE OIL ON LOBSTER, (HOMARUS AMERICANUS) BEHAVIOR,
Woods Hole Oceanographic Institution, Mass.
J. Atema, and L. Stein.
Available from the National Technical Information Service as PB-213 872, $4.85 in paper copy, $1.45 in microfiche. Report to Environmental Protection Agency, Technical report WHOI-72-74. September 1972. 76 p, 18 fig, 5 tab, 10 ref, 4 append. GPA Project 18080 EBN.

Descriptors: *Pathology, *Lobsters, *Animal behavior, *Oil pollution, Animal physiology, Seawater, Marine animals, Organic compounds, Feeding rates, Laboratory tests.
Identifiers: *Sublethal effects, Crude oil, Homarus americanus.

Methods of determining sublethal effects of crude oil and its waste soluble fractions on lobsters were developed under carefully controlled conditions. The most reproducible pattern in the lobsters' behavior, its feeding, was used as a standard for measuring sublethal oil effects. As a measure of physiological damage, the microscopical and submicroscopical structures of the aesthetasc hairs on the antennules were chosen; these serve an olfactory function and together with the gills are probably the membranes most sensitive to the outside environment. Light and electron microscopy showed no observable changes in morphology of odor receptors. Results are interpreted as the depressing quality of crude oil as a bad odor effect. Small quantities of crude oil (0.9 ml in 100 l of seawater) interfere with some specific, possibly chemosensory behavior. Chemical analyses showed that before addition of oil a great quantity of lipids was present in the test aquaria. When water was brought in contact with an oil slick, lipid concentration dropped. The same effect was seen in the alkane and the alkene-aromatic hydrocarbon fractions. Oil in sea water followed the usual degradation pattern. (Jones-Wisconsin)
W73-14894

MAJOR CAUSE OF ALGAE AND WEEDS IN LAKE MENDOTA,
Wisconsin Univ., Madison.
M. S. Nichols.
Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol 61, p 229-234, 1973. 1 tab, 5 ref.

Descriptors: *Plant growth, *Bicarbonates, *Alkalinity, *Wisconsin, Algae, Carbon dioxide, Hardness (Water), Aquatic weeds, Calcium, Magnesium, Hydrogen ion concentration, Marl, Nutrients.
Identifiers: *Lake Mendota (Wis.).

In the absence of carbon dioxide or a deficiency from sources other than the atmosphere, the low partial pressure of carbon dioxide in the air limits the rate and quantity of this gas solution in lake water to the extent that large and extended blooms of algae and weed growths would be materially limited. In lakes with a low bicarbonate content, carbon dioxide could be a critical factor for extensive growths of algae and weeds. The bicarbonates of calcium and magnesium in hard-water Lake Mendota, Wisconsin, are the major source of carbon dioxide, as shown by the lowering of the hydrogen ion concentration during extensive growths, causing a rise in pH to 9.5 or 10 and above following rapid growth during hot weather. At times the pH rise causes precipitation of marl deposits in the calcareous waters. Nitrogen, phosphorus, sulfur, and traces of many other elements must be in adequate supply in these bicarbonate waters if growth of algae and weeds is to occur in sufficient quantity to become a nuisance. There is an adequate supply of phosphorus and nitrogen in Lake Mendota from land drainage, precipitation, springs, and through active decomposition of dead algae and weed substances. (Auen-Wisconsin)
W73-14895

HEPATIC AMOEBIASIS IN CEYLON,
Colombo North Hospital (Ceylon).
S. Ramachandran, S. Sivalingham, and J. R. A. Perumal.
J Trop Med Hyg. Vol 75, No 2, p 23-33, 1972, Illus.
Identifiers: *Ceylon, Erythrocyte, *Hepatic amoebiasis, Human pollution, Sedimentation, *Amoebic infection, Epidemiology, Human diseases.

The important factors in the epidemiology of hepatic amoebiasis in the district of Negombo, Ceylon, are: appropriate conditions for the transmission of amoebic infection as evidenced by inadequate sanitary facilities and pollution, together with poor surface drainage, and those which lead to a breakdown in the resistance of the individual, possibly an interaction between chronic alcoholism, inadequate diet, physical exertion and parasitic infestations. The prevalence of these factors appears to a large extent to be the cause of the high incidence of the syndrome in this part of Ceylon. All cases of hepatic amoebiasis were labeled as hepatic amoebiasis-with pus demonstrated and heptic amoebiasis-pus not demonstrated. This simplified classification was based on the observation that it is not possible to demarcate clinically by clear cut signs and symptoms the group of cases where pus may be demonstrated (hepatic abscesses) from the group of cases where pus may not be demonstrated (so called amoebic hepatitis). Laboratory investigations also appear to be of only relative value in differentiating these 2 groups. The only definite indication then, of the presence of an abscess would be either localization with external pointing or rupture. Elevation in the ESR (erythrocyte sedimentation rate) was a striking observation. A useful aid to diagnosis may be the triad, a leukocytosis, an elevated ESR and normal or only mildly elevated serum enzyme values.--Copyright 1973, Biological Abstracts, Inc.
W73-14897

LIFE HISTORY AND GROWTH INHIBITION STUDIES IN PLATYDORINA CAUDATA (VOLVOCACEAE),
Kentucky Univ., Lexington. Dept. of Botany.
D. O. Harris.
Research report (1972), 33 p. 4 tab., 23 ref. OWRR A-018-KY (4).

Descriptors: *Algal control, *Life history studies, *Plant growth substances, *Inhibitors, Cultures, Reproduction, Nitrogen, Phytotoxicity, Biochemistry, Algae, Plant physiology.
Identifiers: *Platydorina caudata, *Volvocaceae, Pandorina morum, Volvox tertius.

Platydornia caudata life history was studied in axenic culture. Asexual reproduction in Platydorina involves several successive cell divisions resulting in the formation of a curved plate or plakea which subsequently inverts to complete the process of daughter colonly formation. Factors which might control the sexual process were examined. Gametogenesis is dependent upon the concentration of nitrogen, and a complete sperm reaction occurs after the nitrogen supply has been depleted. Sperm differentiation is a linear response to nitrogen depletion. An autoinhibitory substance was obtained from culture filtrates in which death of the culture had occurred. Bioassay of the autoinhibitory substance was performed and specificity, liability, effects of freezing and bacterial contamination, and dialysis observed. It was also observed by studying many strains that a complex system of growth inhibition is operative in the family Volvocaceae. Pandorina morum produced the strongest inhibitor, inhibiting growth of most members of the family and Volvox tertius proved to be the most sensitive. These two genera were therefore used as a model system to study the chemical and physical properties of algal growth inhibitors. (Jones-Wisconsin)
W73-14899

COVER RESPONSE OF FISH IN BIOASSAY OF ACID WATER,
Pennsylvania State Univ., University Park.
J. K.Crawford, and R. L. Butler.
In: Fish and Food Organisms in Acid Mine Waters of Pennsylvania, Environmental Protection Agency, Ecological Research Series EPA-R3-73-032, February 1973. p 1-71, 25 fig, 14 tab, 44 ref. EPA Project 18050 DOG. WP-01539-01-(N)1.

Descriptors: *Fish behavior, *Bioassay, *Hydrogen ion concentration, *Acid mine water, Brook trout, *Pennsylvania, Bass, Laboratory tests, Water pollution effects, Water quality, Habitats, Streams.
Identifiers: *Cover utilization, Longnose dace.

Change in cover utilization and change in activity of fish as a behavioral bioassay were evaluated as to their reliability of a quality criteria for waters receiving acid mine drainage. Four species, cover-seekers and representatives of warm and cold water Pennsylvania streams were tested: smallmouth bass, rock bass, brook trout, and longnose dace. Methods were chosen that measured fish activity and response to cover with changes in pH. Natural unpolluted water, natural water acidified in the laboratory, diluted acid mine water, and treated acid mine water were used. Observations were made in a stream aquarium after a 100-hour period of acclimation to the test water (pH 7.0 through 4.0) and either 1/2 or 24-hour adjustment to the test area. Temperature, water velocity, and light periodicity were controlled. Analysis of variance revealed no relationship between cover utilization and pH levels or between activity and pH levels. Failure of cover utilization and activity to reflect changes in water quality conditions makes this bioassay technique as tested unsuitable for establishment of water quality criteria. (See also W73-11332) (Jones-Wisconsin)
W73-14901

EFFECTS OF ACID MINE DRAINAGE ON FISH POPULATIONS,
Pennsylvania State Univ., University Park.
E. L. Cooper, and C. C. Wagner.
In: Fish and Food Organisms in Acid Mine Waters of Pennsylvania, Environmental Protection Agency, Ecological Research Series EPA-R3-73-032, February 1973. p 73-124, 14 fig, 5 tab, 19 ref. EPA Project 18050 DOG. WP-01539-01-(N)1.

Descriptors: *Acid mine water, *Appalachian Mountain Region, *Fish populations, *Hydrogen ion concentration, Water pollution effects, *Pennsylvania, Water quality, Brook trout, Bass, Resistance, Acidity, Heavy metals, Toxicity, Shiners, Suckers, Rivers, Distribution, Tributaries, Ecological distribution, Speciation, Varieties.
Identifiers: Chain pickerel, Yellow perch, Pumpkinseed.

Effects of acid mine drainage on distribution of natural fish populations in Pennsylvania were investigated. Total acidity, pH, and probably heavy metals are all involved in the toxic action of mine acid drainage on fish populations. Concentrations

of metallic ions in these discharges were not measured but concurrent readings of pH as low as 4.5 and total acidity as low as 15 ppm are sufficient to account for the complete loss of fish populations at about 90% of the stations examined. Of 116 fish species found 10 species exhibited some tolerance to water contaminated with acid mine drainage, ranging from pH 4.6 to 5.5; however, most are unimportant as game. Reclamation of streams receiving acid mine drainage must be sufficient to maintain pH readings not less than 5.5 and a total mineral acidity not exceeding 5 ppm to assure a diverse and productive fish population. Toxicity of heavy metals will be largely avoided if suitable pH and acidity levels are maintained. There are sufficient native populations present in small isolated tributaries to restock most waters once they are properly reclaimed. (See also W73-11332) (Auen-Wisconsin)
W73-14902

ACUTE TOXICITY OF LOW PH TO AQUATIC INSECTS,
Pennsylvania State Univ., University Park.
W. G. Kimmel, and D. C. Hales.
In: Fish and Food Organisms in Acid Mine Waters of Pennsylvania, Environmental Protection Agency, Ecological Research Series EPA-R3-73-032, February 1973. p 125-158, 2 fig, 9 tab, 13 ref. EPA Project 18050 DOG. WP-01539-01 (N)1.

Descriptors: *Acid mine water, *Hydrogen ion concentration, *Aquatic insects, Streams, Bioassay, *Pennsylvania, Acidity, Alkalinity, Sulfates, Toxicity, Water pollution effects, Growth stages, Resistance, Mayflies, Stoneflies.
Identifiers: Nigronia fasciata, Pteronarcys proteus, Boyeria vinosa, Acroneuria lycorias.

The effect of acid mine effluent on the soft-water Pennsylvania streams and on the acute tolerance of five species of aquatic insects to the lowered pH induced by sulfuric acid were studied. Ephemoroptera (Stenonema species), Plecoptera (Acroneuria lycorias and Pteronarcys proteus), Odonata (Boyeria vinosa) and Megaloptera (Nigronia fasciata) were chosen for investigation as benthic fauna representatives. The five species were generally tolerant of short-term exposures to lowered pH levels. There is doubt that low pH alone accounts for the sparse insect fauna characteristic of streams polluted by mine effluent. Aquatic insects may be more sensitive to low pH during molting which may be a critical time for toxicant action thus an increased sensitivity to hydrogen ions during ecdysis could eliminate insects from streams at higher pH levels than their acute toxicity values would indicate. The 96-hour TLm of all five species and their occurrence in naturally acidic streams at pH values 4.0 and 5.0 indicate that they could survive pH 5.0. Apparently other substances acting alone or synergistically with hydrogen ions are responsible for the elimination of benthos in streams receiving mine drainage. (See also W73-11332) (Jones-Wisconsin)
W73-14903

THE ECOLOGY OF THE SOUTHERN CALIFORNIA BIGHT: IMPLICATIONS FOR WATER QUALITY MANAGEMENT.
Southern California Coastal Water Research Project, El Segundo.

Ref. No. SCCWRP TR104, 1973. 531 p, 152 fig, 140 tab, 270 ref. $15.00.

Descriptors: *Bibliographies, *Reviews, *California, Ecology, *Waste water disposal, Coasts, *Environmental effects, Water pollution sources, Water pollution effects, Water quality, Management.
Identifiers: *Southern California Bight.

A 3-year study of the ecology of southern California coastal waters indicated that some concern expressed over the possible harmful effects of municipal wastewater discharges is exaggerated. The study, (which consisted of a 557-entry literature review, laboratory and field programs, and predictive modeling) involved characterization of the general physical, chemical, and biological conditions in the nearshore waters as well as detailed examination of conditions near major wastewater outfalls. Sources of various substances (particulate materials, oil and grease, plant nutrients, trace metals, chlorinated hydrocarbons, etc.) were identified, and input magnitudes were estimated; the study revealed little or no justification for altering present municipal wastewater treatment or discharge practices with regard to the constituents examined, with the exception of floatable materials, highly toxic metals, and chlorinated gydrocarbons. In particular, inland wastewater treatment requirements (such as those relating to biochemical oxygen demand, suspended solids, and nutrients) were found to have little technical relevance to marine ecological problems. Other topics covered in the study (and recommended for further investigation) included diseases in nearshore fishes, indicator organisms, population and community interactions of benthic invertebrates and fishes, stimulatory and toxic effects of wastewater on phytoplankton and benthic organisms, and constituent inputs through industrial discharges, vessel-related activities, dredge spoil, surface runoff, aerial fallout, and advection.
W73-14914

KINETICS OF ORTHOPHOSPHATE UPTAKE BY PHYTOPLANKTON POPULATIONS IN LAKE WINNEBAGO,
Wisconsin Univ., Madison. Dept. of Botany.
S. Bartell, and S. Richman.
Trans Wis Acad Sci Arts Lett. 60: p 147-178. 1972. Illus.
Identifiers: Carbon, Chlorophyll, Equations, Kinetics, Lake, *Orthophosphates, *Phytoplankton, Primary production, *Wisconsin, *Lake Winnebago (Wis).

The growth of natural phytoplankton populations of Lake Winnebago, Wisconsin, was investigated with regard to orthophosphate limitation. An ascorbic acid-antimony modification of a standard molybdenum blue colorimetric test for orthophosphate showed a concentration of 94.0 microgram/l in late Nov., 1970. This concentration steadily decreased to a minimum of 29.0 microgram/l in early Feb., 1971. With the removal of ice cover and increased allochthonous addition of phosphate associated with the spring thaw, the orthophosphate concentration increased to 109.0 microgram/l in early April. A standard acetone extraction procedure showed that chlorophyll concentrations followed asimilar trend in seasonal variation. The 2.2 mg/m3 concentration found in the Jan. 9, 1971 sample decreased to a minimum of 0.4 mg/m3 for the Jan. 24 sample. The chlorophyll concentration gradually increased to 20.8 mg/m3 by early April. Primary productivity measured by a standard 14C technique, increase in biovolume determined by the Model B Coulter Counter and chlorophyll production were used to study the kinetics of orthophosphate uptake in enrichment experiments where varied amounts of orthophosphate, were added to samples of Lake Winnebago water. The resulting changes in the rates of these parameters suggest that uptake followed the Michaelis-Menten equation, modified for nutrient limitation theory for enriched samples collected on Feb. 2 and Feb. 20, 1971. This model may also apply to the Nov. and April populations; however, a limitation in experimental design prohibited the calculation of Vmax (maximum uptake rate) and Kt (transport constant ± substrate concentration at which uptake rate ± 1/2 Vmax). Orthophosphate was determined to be a limiting factor for productivity in Lake Winnebago over the winter months.--Copyright 1973, Biological Abstracts, Inc.
W73-14918

ORIGIN OF TOXIC MATERIALS IN THE KRAFT PULPING PROCESS,
British Columbia Research Council, Vancouver
For primary bibliographic entry see Field 05B.
W73-14931

SOME FACETS OF THE IMPACT OF PULP MILL EFFLUENT ON THE ALBERNI INLET,
Fisheries Research Board of Canada, Nanaimo (British Columbia)
For primary bibliographic entry see Field 05B
W73-14932

ECOLOGICAL IMPLICATIONS OF FALLOUT RADIOACTIVITY ACCUMULATED BY ESTUARINE FISHES AND MOLLUSKS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05B.
W73-14961

BIOKINETICS OF ENVIRONMENTAL TRITIUM,
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 05B.
W73-14962

STUDIES ON THE FOOD CHAIN CONTAMINATION BY TRITIUM,
Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).
For primary bibliographic entry see Field 05B.
W73-14963

BEHAVIOR OF TRITIUM IN FISH FOLLOWING CHRONIC EXPOSURE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
T. J. Morgan, R. R. Landolt, and J. Hamelink.
In: Tritium, p 378-381, May 1973. 3 fig. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Tritium, Radioactivity, *Fish behavior, Environment, Water pollution effects, Assay, Toxicity, Excretion, Bioassay, Biological communities, Hydrobiology, Biocontrol, Food chains, Absorption, *Channel catfish, Fish management.

The release of tritium from power reactors presents a need for evaluating the fate of this radionuclide in fish. This information is desirable, not only from the standpoint of game fishing, but particularly with regard to commercial fish farming. The growing of fish, such as channel catfish (Ictalurus punctatus), to edible sizes in cage culture systems is often done in natural bodies of water, and heated effluents from some power plants may be discharged into the waters of commercial fish farms. The information presented is the result of a preliminary evaluation of the uptake and elimination of tritium by fish grown in tritiated water. (Houser-ORNL)
W73-14964

TRITIUM IN THE ATMOSPHERE AND OCEAN,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 05B.
W73-14965

ENVIRONMENTAL TRITIUM,
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 05B.
W73-14966

THE DOSE TO MAN VIA FOOD-CHAIN TRANSFER RESULTING FROM EXPOSURE TO TRITIATED WATER VAPOR,
California Univ., Livermore. Lawrence Livermore Lab.
L. R. Anspaugh, J. J. Koranda, W. L. Robinson, and J. R. Martin.
In: Tritium, p 405-422, May 1973. 4 fig, 4 tab, 39 ref. Messenger Graphics, Phoenix, Arizona. Price: $35.00.

Descriptors: *Tritium, *Food chains, *Public health, *Water vapor, *Prediction, *Mathematical model, Air pollution effects, Toxicity, Radioactivity, Environment, Behavior, Ecology absorption, Vegetable crops, Milk.

The purpose is to provide a more accurate, but also a simple model to predict doses to man resulting from food-chain contamination due to exposure to tritiated water vapor. Knowledge concerning the environmental behavior of tritiated water was obtained during radioecology studies at Project Rulison and controlled exposures at Livermore which have been discussed by Koranda and Martin. The model is specifically directed to the prediction of dose from the release of tritiated water vapor from a point source, but most of the model is applicable to any tritiated water vapor exposure. Dose commitments via inhalation plus absorption and via the ingestion of vegetables, milk, and meat are considered. The model may be entered with a variety of input data; average values of the parameters needed to evaluate the model are provided, but other values more appropriate to a particular situation may be readily substituted. (Houser-ORNL)
W73-14967

GUIDANCE FOR LIMITING ENVIRONMENTAL RELEASES OF TRITIUM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W73-14968

TRANSFER OF TRITIUM FROM METHANE TO VEGETATION,
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 05B.
W73-14969

THE BEHAVIOR OF TRITIUM IN THE SOIL,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 05B.
W73-14970

MAN AND THE ENVIRONMENT, A BIBLIOGRAPHY OF SELECTED PUBLICATIONS OF THE UNITED NATIONS SYSTEM, 1946-1971.
United Nations, New York.

UNIPUB Inc./R.R. Bowker Company, New York and London, 1972. H. N. M. Winton, Compiler. 305 p, 1219 ref. Price: $12.50.

Descriptors: *Bibliographies, *United Nations, *Publications, *Environmental effects, Nuclear wastes, Water pollution, Oceanography, Hydrologic aspects, Water resources, River basin development, Flood control, Irrigation, Drainage, Priorities.

References with indicative-type abstracts are listed under 65 major categories (numbers of references in parentheses): oceanography (33), hydrometeorology and hydrology (45), water resources (79), river basin development (10), flood control (17), irrigation and drainage (13), water pollution (9), disposal of radioactive wastes (28), marine pollution (6), and bibliographies (52). Author, title, subject, and serial indexes are provided. The publications include committee recommendations, seminars, conferences, symposia, collections of statistics or of texts of laws, technical manuals, directories of national and international institutions and documentation centers, bibliographies, and reports of conditions in developing countries. Prices are listed for the documents not out-of-print. (Bopp-ORNL)
W73-14974

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF ENRICO FERMI ATOMIC POWER PLANT - UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-14979

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF DUANE ARNOLD ENERGY CENTER.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-14980

CONTAMINATION OF WATER BODIES AND BIOLOGICAL ASSESSMENT OF WATER QUALITY (ZAGRYAZNENIYE VODOYEMOV I BIOLOGICHESKAYA OTSENKA KACHESTVA VOD),
Moscow State Univ. (USSR).
N. S. Stroganov.
Vodnyye Resursy, No 2, p 34-52, 1972. 5 fig, 1 tab, 62 ref.

Descriptors: Water pollution, *Water pollution effects, *Water quality, Bodies of water, Biology, Biological communities, Ecosystems, Aquatic life, *Toxicity, Toxins, Surface waters.
Identifiers: USSR, *Hydrobionts, *Saprophytes.

Surface-water quality is affected by hydrobiont activity consistent with the hydrologic regime of water bodies. Examined are: (1) general reactions of hydrobionts to the effects of toxic substances; (2) diversity of species as an index of pollution; (3) importance of toxicity in the study of problems relating to degradation of the water medium; and (4) importance of a systems approach in assessing possible changes in biological processes and water quality resulting from the presence of toxic substances. Diversity of species is presently a much better biological index of water quality than either the presence or absence of certain species, although a determination of this index is time consuming and not altogether reliable. (Josefson-USGS)
W73-15007

PROBLEMS IN THE STUDY AND REGULATION OF ANTHROPOGENIC EUTROPHICATION OF WATER BODIES IN THE USSR (ZADACHI IZUCHENIYA I REGULIROVANIYA ANTROPOGENNOGO YEVTROFIROVANIYA VODOYEMOV V SSR),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
L. L. Rossolimo.
Vodnyye Resursy, No 2, p 171-179, 1972.

Descriptors: *Eutrophication, Bodies of water, *Lakes, *Canada, *Foreign research, Investigations, Water pollution sources.
Identifiers: *USSR.

Immediate problems in the study and regulation of eutrophication of water bodies in the USSR resulting from man's activities are discussed on the basis of foreign research. Present state of knowledge of this phenomenon, characteristics of water bodies, and major sources of eutrophication in the USSR are examined. Recent experimental investigations of man's contribution to eutrophication of lakes in Canada are described. (Josefson-USGS)
W73-15012

THE ACCUMULATION OF ARSENIC FROM ARSENIC-RICH NATURAL WATERS BY AQUATIC PLANTS,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Applied Biochemistry Div.
P. F. Reay.
J Appl Ecol. Vol 9, No 2, p 557-565. 1972. Illus.
Identifiers: Accumulation, *Aquatic plants, *Arsenic, Bottoms, Lakes, *New Zealand (Waikato River), Rivers, Sea, Toxicity.

Several aquatic plants were found to accumulate As from the Waikato river (New Zealand) to levels well above those associated with toxicity. The species examined differed in the concentrations to which they acculated As and the average values ranged from 30-650 mg/kg of the dry weight. Accumulation was influenced by the amount of As in the water but not by the amount in the river and lake bottoms. The withdrawal of As from the river water by aquatic plants does not seem to markedly affect the discharge of As into the sea.--Copyright 1973, Biological Abstracts, Inc.
W73-15019

GROWTH, GAS VACUOLATION AND BUOYANCY IN A NATURAL POPULATION OF A PLANTONIC BLUE-GREEN ALGA,
Freshwater Biological Association, Shrewsbury (England). Meres Lab.
C. S. Reynolds.
Freshwater Biol. Vol 2, No 2, p 87-106. 1972. Illus.
Identifiers: Alga, Anabaena-Circinalis, Blooms, Buoyancy, *Eutrophication, *Gas vacuolation, Germination, Growth, Lakes, Phosphorus, Photosynthesis, Planktonic populations, Spore, Temperature, *Cyanophyta.

The growth and development of a natural population of Anabaena circinalis is described in relation to physical and chemical conditions within a small, shallow eutrophic lake. Germination of resting spores took place when the lake was destratified, in response to improving conditions of light and temperature. The growth of the population was monitored for chlorophyll and nutrient content, and parallel determinations of heterocyst ratio, gas vacuole volume, turgor and buoyancy were made. Growth of the population was probably limited by P deficiency. Cessation of growth was marked by increases in gas vacuole volume and buoyancy. Gas vacuole volume is determined primarily by the rate of increase of the alga. It is modified by turgor changes, associated with photosynthetic rates. Surface blooms are the result of the redistribution of buoyant algae when turbulence currents are weak. Buoyancy is increased in algae lodged at the surface.--Copyright 1973, Biological Abstracts, Inc.
W73-15022

UPTAKE OF SELENIUM BY AQUATIC ORGANISMS,
Elainlasketieteellinen Korkeakoulu, Helsinki (Finland). Dept. of Medicine.
For primary bibliographic entry see Field 05B.
W73-15079

THE LIGHT DEPENDENCE OF NITRATE REDUCTASE IN MARINE PHYTOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-15082

NITRATE REDUCTASE ACTIVITY DURING A DINOFLAGELLATE BLOOM,
North Carolina State Univ., Raleigh. Dept. of Zoology.
W. G. Harrison.
Limnology and Oceanography, Vol 18, No 3, p 457-465, May 1973. 5 fig, 1 tab, 13 ref.

Descriptors: *Nutrients, *Growth rates, *Biomass, *Water quality, Dominant organisms, Phytoplankton, Enzymes, Nitrates, Nitrites, Ammonia, Water temperature, Phosphates, Limiting factors, Salinity, Metabolism, Water pollution effects, North Carolina.
Identifiers: *Nitrate reductase, *Peridinium triquetrum, Sample preparation, Pamlico River.

Samples of water and plankton were collected from the Pamlico River for measurement of ammonia, nitrate, nitrite, and phosphate contents, nitrate reductase (NR) activity, and phytoplankton population. Water temperature and salinity were also determined. The purpose was to determine what conditions gave rise to winter dinoflagellate (Peridinium triquetrum) blooms. NR activity was determined by filtering samples through a glass fiber filter, grinding the filter with a Teflon-glass homogenizer in phosphate buffer and dithiothreitol, and centrifuging the crude enzyme extract out. This extract was incubated for 45 min. with NADH and the NR activity calculated as the amount of nitrite formed. NR activity paralleled the development of a winter dinoflagellate bloom. High enzyme activity was associated not only with high algal biomass, primarily of Peridinium triquetrum, but also with low nitrate concentrations in the typically nitrate-rich waters. Nitrate was an important source of nitrogen for the bloom organisms in spite of the abundance of ammonium. The initiation and cessation of nitrate assimilation seemed closely related to the appearance and disappearance of the bloom. Although nitrate metabolism may be an important factor in bloom timing, temperature, salinity, and flushing of the system are also involved. (Little-Battelle)
W73-15083

EFFECTS OF EXPOSURE TO SUBLETHAL DDT ON THE EXPLORATORY BEHAVIOR OF GOLDFISH (CARASSIUM AURATUS),
Texas A and M Univ., College Station. Dept. of Biology.
F. B. Davy, H. Kleerekoper, and J. H. Matis.
Water Resources Research, Vol 9, No 4, p 900-905, August 1973. 1 fig, 1 tab, 18 ref.

Descriptors: *Fish behavior, *Bioassay, *Laboratory tests, *DDT, *Water pollution effects, *Pesticide toxicity, Freshwater fish, Laboratory animals, Insecticides, Chlorinated hydrocarbon pesticides, Data collections, Data processing.
Identifiers: *Goldfish, Pollutant effects, Carassius auratus, Recovery, p p' DDT, Data interpretation, Chemical concentration, Neurogenicity.

When they are introduced into a novel environment, normal goldfish display a highly specific nonrandom exploratory behavior. It consists of a systematic spatial and temporal distribution of activity that in the light of its complexity is assumed to be under the control of the central nervous system. Fourteen goldfish were used to investigate such exploratory behavior as influenced by exposures to subacute concentrations of DDT. The fish were kept individually in fiberglass tanks in 100 l of stagnant aerated water at a mean temperature of 21C. Locomotor behavior was monitored over a 20-hour period before treatment and again 4 days later after exposures which were continuous. Once every 24 hr each fish was transferred to a clean tank containing a 10 micrograms/l concentration of p,p'-DDT. Aspects of this exploratory behavior were significantly affected by chronic exposure to DDT (10 micrograms/l p,p'-DDT for 4 days), and thus earlier suggestions in the literature that the pesticide may affect functions controlled by the central nervous system were reinforced. The maintenance of the fish for 20 hours in laboratory water following exposure to DDT resulted in a decrease in the described DDT effect. (Holoman-Battelle)
W73-15085

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
J. S. Alabaster, D. Calamari, M. Grande, T. B. Hasselrot, and R. Lloyd.
Water Research, Vol 7, No 6, p 929-941, June 1973. 2 tab, 99 ref.

Descriptors: *Odor, *Taste, *Phenols, *Fish, *Toxicity, *Water quality standards, Algae, Bacteria, Protozoa, Crustaceans, Mollusks, Industrial wastes, Dissolved oxygen, Water pollution effects, Salinity, Water temperature, *Reviews, Water quality, Cyanides, Domestic wastes, Animal wastes (Wildlife), Rainbow trout, Carp, Hydrogen ion concentration, Hardness (Water), Chlorination, Brown trout, Perches, Sunfishes, Pikes, Freshwater fish, Eels, Fishkill, Waterfleas, Shrimp, Snails, Mayflies, Mosquitoes, Midges, Copepods, Isopods, Amphipoda, Rotifers, Organic acids, Caddisflies, Sticklebacks, Alcohols.
Identifiers: Cresols, Xylenols, Aldehydes, Pyrocatechol, Resorcinol, Hydroquinone, Guaiacol, Naphthols, Aniline, Quinols, Monohydric phenols, Dihydric phenols, Polyhydric phenols, Coke, Oil refineries, Livestock dip, Catechols, Crucian carp, Fathead minnow, Mosquitofish, Coho salmon, Sturgeon, Tench, Bream, Britterling, Gudgeon, Roach, Rudd, Guppy, Gas liquor, Grayling, Chub, Barbel, Bluntnose minnow, Green sunfish, Chlorinated hydrocarbons, Ostracods, Goldfish, Chlorophenols, Brown bullhead.

Review of the literature concerning the occurrence and effects of phenols in the aquatic environment shows that phenolic wastes can contain monohydric phenols, including phenol, the three cresol isomers, and the six xylenol isomers, together with other substances. They may adversely affect freshwater fisheries by their direct toxicity to fish and fish-food organisms, by their high oxygen demand resulting in oxygen depletion of the receiving water, and by the production of undesirable flavors in the edible flesh of fish. Laboratory tests show that the toxicity of phenol is increased by decrease in dissolved-oxygen concentration, increase in salinity, and decrease in temperature. Salmonids and newly hatched fish are more sensitive than coarse fish and adults, respectively. Cresols, xylenols, and phenols are of similar toxicity, and the toxicity of mixtures of phenols is apparently additive, although the toxicity of phenolic wastes may be greater than expected from chemical analyses, since these may not be equally sensitive to all phenols and may neglect the contribution from other poisons. Because of difficulties caused by inadequate chemical analysis there are few field observations which can be used to reinforce laboratory findings. For this reason, and also because of gaps in knowledge of the effect of temperature on toxicity, only tentative criteria can be established, which may have to be modified in the light of further experience. These criteria are expressed as maximum concentrations which should not be exceeded but it should be appreciated that because of the natural fluctuation in the water quality found in rivers over a period of time, the average concentration will be lower to an extent depending on local circumstances. Maximum permissible levels for salmonids, coarse fish, and commercial fisheries are given. (Little-Battelle)
W73-15086

IN VITRO HYDROLOYSIS OF POLYOXYETHYLENE ESTERS BY TISSUES OF THE AMERICAN EEL AND ATLANTIC SALMON,
Fisheries Research Board of Canada, St Andrews (New Brunswick) Biological Station
For primary bibliographic entry see Field 05B.
W73-15087

EXPOSURE OF DOGFISH SHARK FETI TO MERCURY,
Oregon State Univ , Astoria Sea Food Lab
E A. Childs, J N Gaffke, and D L. Crawford
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 5, p 276-280, May 1973 2 tab, 12 ref.

Descriptors: *Mercury, *Pollutant identification, *Water pollution effects, Chemical analysis, Marine fish, Path of pollutants, Heavy metals, Sharks, Embroyonic growth stage, Marine animals.
Identifiers: *Pacific spiny dogfish, *Fetus, *Bioaccumulation, Animal tissues, Flameless atomic absorption spectrophotometry, Sample preparation, Squalus suckleyi.

The relationship of maternal mercury load to fetal mercury load was examined in the Pacific spiny dogfish shark (Squalus suckleyi). S. suckleyi samples from the continental shelf adjacent to the North Oregon coast were homogenized and digested in 4 volumes of 1:1 (v/v) concentrated nitric and sulfuric acid. After digestion 3-5 drops of hydrogen peroxide were added followed by deionized water. The amount of mercury was determined by flameless atomic absorption spectrophotometry. Total mineral content, and the protein and lipid content of follicle and maternal samples were determined. The level of mercury in the fetus was significantly lower than in the mother. Maternal muscle samples had a mean mercury content of 0.66 ppm with a range of 0.332 - 0.999 ppm. There was no apparent relationship between the concentrations of mercury in the fetus and mother. Regardless of the concentration of mercury in the maternal tissue, no fetal sample taken from undamaged uteri contained greater than 0.058 ppm mercury, and no follicle greater than 0.119 ppm mercury. These data clearly demonstrate that mercury is not concentrated in S. suckleyi feti in situ. Follicle and fetal stages had an equal or higher ash content than did the maternal tissue which indicates that there is no general inhibition of movement of minerals into the fetus. The data show that mercury is uniquely absent from the fetal environment, and suggest that it may be selectively excluded. (Holoman-Battelle)
W73-15088

COMPARISON OF THE METABOLISM OF PARATHION BY LOBSTERS AND RATS,
Rhode Island Univ., Kingston. Coll. of Pharmacy.
G. P. Carlson.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 5, p 296-300, May 1973. 2 tab, 13 ref.

Descriptors: *Animal metabolism, *Pesticide toxicity, *Bioassay, *Lobsters, Phosphothioate pesticides, Organophosphorus pesticides, Insecticides, Laboratory tests, Crustaceans, Lethal limit, Small animals (Mammals).
Identifiers: *Parathion, *Rats, *Fate of pollutants, Pollutant effects, Median tolerance limit, Metabolites, p-Nitrophenol, Paraoxon, Data interpretation, Animal tissues, Liver, Hepatopancreas, Biotransformation.

Adult male rats and male lobsters were exposed to parathion in a comparative acute toxicity and metabolic study of this organophosphorus pesticide. To test acute lethality to lobsters, various doses of parathion were injected into the cheliped sinuses of the lobsters after which the individuals were maintained in artificial aerated seawater at 13C for 48 hr. Prepared homogenates of rat livers

and lobster hepatopancreases were used to study the metabolism of parathion to p-nitrophenol. Microsomal fractions were used to study the metabolism of parathion to paraoxon. An approximate LD sub 50 of 0.3 mg/kg was obtained for the lobsters. Preliminary experiments on the conversion of parathion to paraoxon indicated that initial incubation of tissue containing 0.2 to 0.5 mg protein resulted in paraoxon concentrations which could be measured by acetylcholinesterase inhibition. In the case of lobsters, no paraoxon formation could be detected even though up to 12.2 mg microsomal protein were employed. It was readily apparent that rats metabolize parathion (either directly or after transformation into paraoxon) to p-nitrophenol several times faster in vitro than do lobsters. When the temperature of incubation was decreased to 20C there was a dignificant decrease in activity in the rats but a significant increase in activity in the lobsters. (Holoman-Battelle)
W73-15090

RESIDUES OF MIREX IN CHANNEL CATFISH AND OTHER AQUATIC ORGANISMS,
Animal and Plant Health Inspection Service, Gulfport, Miss.
H. L. Collins, J. R. Davis, and G. P. Markin.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 2, p 73-77, August 1973. 1 tab, 12 ref.

Descriptors: *Pesticide residues, *Fish farming, *Bioassay, *Channel catfish, Dragonflies, Crayfish, Water pollution effects, Toxicity, Freshwater fish, Absorption, Minnows, Food chains, Public health, Chlorinated hydrocarbon pesticides, Path of pollutants.
Identifiers: *Bioaccumulation, *Mirex, Cricket frog, Mosquitofish, Tadpoles, Biological samples, Macroinvertebrates, Sample preparation, Gas liquid chromatography.

The use of mirex to control fire ants in areas of catfish farming has caused concern about the possible accumulation of the pesticide in fish. To study the effects of mirex treatment, a pond 3.5 feet deep containing caged and uncaged channel catfish (Ictalurus punctatus), minnows (Opsopoeodus emiliae), mosquitofish (Gambusia affinis), cricket frogs (Acris gryllus), tadpoles, crayfish (Cambarellus shufeldti), and dragonfly nymphs and the surrounding area were treated with mirex at a rate of 1.25 lbs/acre. Mortality of fish in cages was assessed, and residues of mirex were determined by gas liquid chromatography of composited whole body samples of each species. Samples were prepared by grinding in a mortar and pestle, extracting with hexane, and concentrating by heating and distillation. Observation of fish for 6 months after the treatment showed no mortality, deformities, or ill effects on caged fish. Uncaged catfish gradually built up residues of mirex to a maximum level of 0.65 ppm after 6 months. After 16 months, the concentration was 0.44 ppm. Caged fish, however, contained no detectable residues apparently because the catfish did not feed directly on the pesticide, but rather accumulated it through the food chain. All other organisms analyzed contained residues which in most cases were still detectable after 16 months. It is concluded that treatment of areas of catfish farming with mirex poses no hazard since the fish are fed artificial food and therefore will not feed on organisms containing residues. (Little-Battelle)
W73-15091

ORAL TOXICITY OF CHLORINATED DIBENZOFURANS TO JUVENILE ATLANTIC SALMON,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
V. Zitko, and P. M. K. Choi.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 2, p 120-122, August 1973. 1 tab, 5 ref.

Descriptors: *Atlantic salmon, *Toxicity, *Juvenile fish, Cold-water fish, Chemical analysis, Path of pollutants, Mortality, Polychlorinated biphenyls, Foods, Lethal limit, Bioassay.
Identifiers: Dichlorodibenzofuran, Trichlorodibenzofuran, Tetrachlorodibenzofuran, Octachlorodibenzofuran, *Bioaccumulation, Salmo salar, *Chlorinated dibenzofurnas, Animal tissues, Muscle, Intestine, Biological magnification.

Dry fish food was spiked with di-, tri-, tetra-, and octachlorodibenzofuran and fed several times a day to juvenile Atlantic salmon kept in a fiberglass tank in running water at 10 C and a 16-h light, 8-h dark photoperiod. The method of Zitko (1972) was used to analyze the fish food and the muscle and gut of fish that died between the 81st and 135th day of the experiment, and of fish surviving for 140 days. The median mortality of 120 plus or minus 30 days occurred among the fish fed the spiked food. Di-, tri-, and tetrachlorodibenzofuran were not detectable in any of the samples. The dead fish contained about 10 times higher concentration of octachlorodibenzofuran in the gut and 3 times higher concentration in the muscle than the fish alive after 140 days. The observed levels of octachlorodibenzofuran may be only a measure of the amount of ingested food, not associated with the toxic effects. The presented data indicate that in fish, as well as mammals, chlorinated dibenzofurans are much more toxic than PCB. The results indicate that because of the high toxicity and low residual levels of chlorinated dibenzofurans, a more sensitive analytical method is required. (Holoman-Battelle)
W73-15092

THE ACUTE TOXICITY OF A YELLOW PHOSPHORUS CONTAMINATED DIET TO BROOK TROUT (SALVELINUS FONTINALIS),
Memorial Univ. of Newfoundland, St. John's.
G. L. Fletcher.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 2, p 123-128, August 1973. 2 tab, 9 ref.

Descriptors: *Toxicity, *Lethal limit, *Brook trout, *Fish diets, *Bioassay, Phosphorus, Freshwater fish, Poisons, Laboratory tests, Chemical analysis, Cold-water fish.
Identifiers: *Yellow phosphorus, Pollutant effects, Salvelinus fontinalis, Cod (Fish), Hemolysis, Bioaccumulation, Hematocrit, Animal tissues, Muscle, Liver, Chemical concentration, Median tolerance limit.

An experiment is described which shows that yellow phosphorus contaminated cod muscle and liver tissues are lethal when consumed by brook trout. Yearling brook trout were divided into four experimental groups, each of which was fed a maximum of 18 g of tissue per day. Each fish was removed from its tank when dead, and a hematocrit was obtained from a caudal blood vessel. The concentration of yellow phosphorus in the cod and trout tissues was determined by gas-liquid chromatography. The yellow phosphorus concentration of the liver fed the trout was 194 micrograms/g and the muscle contained 4-11 micrograms/g. The LT sub 50 for those trout fed phossy liver was 600 hr and for those fed phossy muscle, 1400 hr. At death the hematocrits of the phossy liver fed trout were significantly lower and the livers were larger than those of the controls. Yellow phosphorus was only detectable in the first two trout to die (216 and 240 hours). The average concentrations (microgram/g) found were as follows; intestinal contents 0.28, brain 0.33, spleen 0.25, muscle 0.13, liver 0.02. At death, the hematocrits of the phossy muscle fed trout were significantly greater than those of the control trout. Yellow phosphorus was not detectable (less than 0.002 microgram/gm) in any of the trout tissues. The symptoms of P4 poisoning were identical to those observed when this element is present in water (FLETCHER et al. 1970), namely, external redness, hemolysis and reduced hematocrits. The approximate toxic dosage of P4 ranged from 1.23-2.73 mg. (Holoman-Battelle)
W73-15093

ABSENCE OF ACUTE EFFECTS ON THREESPINE STICKLEBACKS (GASTEROSTEUS ACULEATUS) AND COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO RESUSPENDED HARBOR SEDIMENT CONTAMINANTS,
Washington Univ., Seattle. Coll. of Fisheries.
R. S. LeGorge, and D. M. DesVoigne.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1240-1242, August 1973. 1 fig, 2 tab, 5 ref.

Descriptors: *Bioassay, *Water pollution effects, *Coho salmon, *Soil contamination, Fish behavior, Chemical oxygen demand, Zinc, Lead, Marine fish, Oil, Suspended solids, Fry, Laboratory tests, *Washington.
Identifiers: *Stickleback, *Suspended sediments, Gasterosteus aculeatus, Volatile solids, Grease, Organic nitrogen, Duwamish Waterway (Wash), Oncorhynchus kisutch.

Threespine sticklebacks (Gasterosteus aculeatus) and coho salmon fry (Oncorhynchus kisutch) were challenged in static 96-hr bioassays with suspensions of sediment from the Duwamish Waterway, Seattle, Wash. Ten test fish per 10-gal aquarium were starved for the duration of the acclimation period (72 hr) and for the 96-hr experimental periods. Doses of up to 5 percent wet weight (28.8 g/liter dry weight basis) were used. The criterion of effect on the fish was loss of equilibrium; aquaria were checked at 3, 6, 12, 24, 36, 48, 72, and 96 hr. No observable effect on the fish of contaminants released from the sediment was elicited, although high levels of those contaminants, such as volatile solids, COD, organic nitrogen, oil and grease, zinc, and lead, were present. (Holoman-Battele)
W73-15095

TOXICITY OF TFM (LAMPRICIDE) TO SIX EARLY LIFE STAGES OF RAINBOW TROUT (SALMO GAIRDNERI),
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. E. Olson, and L. L. Marking.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1047-1052, August 1973. 1 fig, 1 tab, 18 ref.

Descriptors: Water pollution effects, *Rainbow trout, *Growth stages, *Pesticide toxicity, *Fish control agents, *Bioassay, Fish repellents, Fish physiology, Piscicides, Phenolic pesticides, Halogenated pesticides, Laboratory tests, Lethal limit, Fish eggs, Fry, Juvenile fish, Hardness (Water), Resistance, Freshwater fish, Cold-water fish.
Identifiers: *TFM, *Lampricides, Pollutant effects, Median tolerance limit.

The lampricide TFM (3-trifluoromethyl-4-nitrophenol) was tested against the following life stages of rainbow trout (Salmo gairdneri): green eggs, eyed eggs, sac fry, swim-up fry, fry, and fingerlings in four water hardnesses (12, 44, 170, and 320 mg/liter as CaCO3). The eyed egg stage was one of the most resistant stages tested, and the sac-fry stage was one of the least resistant. Increased water hardness decreases toxicity to all stages. The LC50's range from 0.532 mg/liter to 40.0 mg/liter depending upon life stage, water hardness, and duration of exposure. The margin of safety for coexisting species exposed to TFM ranges from 3.2 to 4.1 in natural waters. The margin of safety for early life stages of rainbow trout and larval lamprey under controlled laboratory conditions ranges from 4.2 to 12.2. Therefore, all six early life stages of rainbow trout are safe in

minimum lampricidal concentrations of TFM. (Holoman-Battelle)
W73-15096

TEMPERATURE SELECTION OF ATLANTIC SALMON (SALMO SALAR) AND BROOK TROUT (SALVELINUS FONTINALIS) AS INFLUENCED BY VARIOUS CHLORINATED HYDROCARBONS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
R. H. Peterson.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1091-1097, August 1973. 4 fig, 2 tab, 14 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Atlantic salmon, *Brook trout, *Polychlorinated biphenyls, *Fish behavior, *Bioassay, *Juvenile fish, Water pollution effects, Water temperature, DDT, DDD, DDE, Freshwater fish, Pesticide toxicity, Aldrin, Thermocline, Laboratory tests.
Identifiers: *Temperature selection (Trout), Isomers, Data interpretation, Metabolites, DDA, Methoxychlor, Aroclor 1254, p p' DDT, o p' DDT, p p' DDD, p p' DDA, p p'-Dichlorobenzophenone.

Data are presented which describe the effects of several compounds structurally related to DDT and of two other chlorinated hydrocarbons (aldrin and a PCB preparation) on temperature selection by juvenile Atlantic salmon (Salmo salar) in a horizontal temperature gradient. The effects of p,p'-DDT and p,p'-DDD on temperature selection of underyearling brook trout (Salvelinus fontinalis) in a vertical gradient are also presented. The effects of previous exposure to p,p'-DDT, o,p'-DDT, p,p'-DDD, p,p'-DDE, and methoxychlor on temperature selection by juvenile Atlantic salmon in a horizontal temperature gradient were similar. Exposure to low concentrations resulted in no change or a decrease in selected temperatures as compared to control values of about 16 C. Exposure to higher concentrations raised selected temperatures. The concentrations of the substances required to produce a given effect varied as: p,p'-DDT greater than or equal to p,p'-DDD greater than methoxychlor greater than o,p'-DDT greater than p,p'-DDE. Exposure levels of p,p'-DDA less than or equal to 8 ppm did not alter temperature selection nor did exposure to Aroclor 1254, a polychlorinated biphenyl (PCB) preparation at 2 ppm. Aldrin lowered temperature selection at 0.1-0.15 ppm. In a vertical gradient, brook trout previously exposed to p,p'-DDT and p,p'-DDD selected higher temperatures than controls. (Holoman-Battelle)
W73-15097

BEHAVIOR OF THE PLANKTONIC COELENTERATES, SARSIA TUBULOSA, PHIALIDIUM GREGARIUM, AND PIEUROBRACHIA PILEUS IN SALINITY DISCONTINUITY LAYERS,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
M. N. Arai.

Descriptors: *Zooplankton, Marine animals, *Animal behavior, *Environmental effects, Invertebrates, Salinity, Swimming, Fishing, Floating, Sea water.
Identifiers: *Coelenterates, *Ctenophora, *Salinity discontinuity layers, Hydrozoans, Sarsia tubulosa, Phialidium gregarium, Pleurobrachia pileus, Macroinvertebrates.

The behavior of Sarsia tubulosa (M. Sars 1835), Phialidium gregarium (L. Agassiz 1862), and Pleurobrachia pileus (O. F. Muller 1776) was investigated in chambers where salinity discontinuity layers could be established. Sarsia tubulosa and P. pileus aggregated at the layer for salinity discontinuities of as little as 0.2 percent although P. gregarium showed more variable behavior. This aggregation was shown to be due to an active response rather than passive flotation in the density barrier set up when low salinity water is placed over high salinity water. Sarsia tubulosa also showed increased fishing activity in any column containing a discontinuity layer compared with any homogeneous control column. (Holoman-Battelle)
W73-15098

EFFECT ON LIME NEUTRALIZED IRON HYDROXIDE SUSPENSIONS ON SURVIVAL, GROWTH, AND REPRODUCTION OF THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Pittsburgh Univ., Pa. Graduate School of Public Health.
E. J. Smith, J. L. Sykora, and M. A. Shapiro.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1147-1153, August 1973. 1 fig, 5 tab, 10 ref.

Descriptors: *Fish reproduction, *Animal growth, Water pollution effects, *Laboratory tests, Freshwater fish, Mortality, Bioassay, Iron, Hardness (Water), Turbidity, Conductivity, *Minnows, *Iron compounds.
Identifiers: *Iron hydroxide, Survival, *Fathead minnow, Iron hydroxide, Pimephales promelas, Hatchability.

The long-term effect of lime neutralized suspended iron on fathead minnow (Pimephales promelas) survival, growth, and reproduction was assessed in a flow-through environment with a modified proportional diluter. Results of 12 months of testing reveal lower survival and declining growth of fathead minnows with an increase in lime neutralized suspended iron concentration. Hatchability and growth of fathead minnows were appreciably reduced in the lowest insoluble iron concentration tested, 1.5 mg Fe/liter. Reduced hatchability was attributed to the higher percentage of smaller particles in low lime neutralized iron concentrations. A comparison of data on survival, growth, and hatchability indicates that the safe level of suspended iron for fathead minnows presumably lies between the control and 1.5 mg Fe/liter. (Holoman-Battelle)
W73-15099

VULNERABILITY AND SURVIVAL OF YOUNG CONNECTICUT RIVER FISH ENTRAINED AT A NUCLEAR POWER PLANT,
Essex Marine Lab., Conn.
B. C. Marcy, Jr.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1195-1203, August 1973. 2 fig, 4 tab, 13 ref.

Descriptors: Freshwater fish, *Connecticut River, *Nuclear powerplants, *Entrainment, Condensers, *Thermal stress, *Cooling towers, Mortality, Intakes, White perch, Carp, Cooling water, Heated water, Environmental effects, Water pollution effects, Larvae, Juvenile fish, Darters, Herrings, Discharge (Water), Outlets, Sea basses, Eels, Shiners, Catfishes, Water sampling, Water temperature, Weirs, *Thermal pollution.
Identifiers: Survival, *Biocides, Mechanical damage, Johnny darter, American eel, Blueback herring, White catfish, Spottail shiner, American shad, Discharge canals, Sodium hypochlorite, Alosa sapidissima, Etheostoma nigrum, Anguilla rostrata, Alewife, Alosa pseudoharengus, Alosa aestivalis, Cyprinus carpio, Ictalurus catus, Notropis hudsonius.

Those mechanical, biocidal, and thermal factors have been studied which influence the survival of fish during passage through the condenser and discharge canal system of the Connecticut Yankee nuclear powerplant. As the river passes the plant, a proportion of its living nonscreenable young fish population is entrained at the plant's intake. Samples were taken 50 m upstream or downstream of the intake on ebb or slack tide and the number of larvae and early juvenile fish per cubic meter of water was calculated as well as percentage of young living fish entrained. Survival in the discharge canal in relation to heat was determined from plankton net collections of larvae and early juvenile fishes at the plant's intake, below the outfall weir, and along the discharge canal at 457, 1200, and 1800 m. Other calculations made were of the: (1) percentages of mortality caused by mechanical damage when all intake pumps were running at capacity with no addition of heat or hypochlorite; and (2) percentage of mortality due to the injection of sodium hypochlorite, while all intake pumps were running and no heat was added. Most of the young fish of nine species that were entrained in the condenser cooling-water system were dead by the time they reached the lower end of the plant's 1.83-km (1.14 mile) long discharge canal. Sampling during June and July, when 95 percent of the nonscreenable fish were abundant near the plant's intake, showed that approximately 80 percent of the mortality in the canal was caused by mechanical damage and 20 percent was attributed to heat shock and prolonged exposure to temperatures elevated above 28 C. There was no measurable mortality due to the injection of sodium hypochlorite into the system as a biocide. The number of nonscreenable living fish entrained at the intake averaged about 4 percent (range 1.7-5.8 percent) of those passing by the plant under conditions of unidirectional net tidal flow. (Holoman-Battelle)
W73-15100

GROWTH TEMPERATURE REQUIREMENTS AND LOWER LETHAL TEMPERATURES FOR JUVENILE SMALLMOUTH BASS (MICROPTERUS DOLOMIEUI),
National Water Quality Lab., Cincinnati, Ohio. Newton Fish Toxicology Lab.
W. B. Horning, II, and R. E. Pearson.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1226-1230, August 1973. 2 tab, 8 ref.

Descriptors: *Juvenile fish, *Growth rates, *Water temperature, *Heat resistance, *Cold resistance, Animal growth, Lethal limit, Mortality, Freshwater fish, Fish diseases, Environmental effects, *Bass.
Identifiers: Median tolerance limit, Growth requirements, Micropterus dolomieui, Growth studies.

Maximum growth rate of juvenile smallmouth bass (Micropterus dolomieui), grown at constant temperatures of 16, 23, 26, 29, 32, and 35 C, occurred at approximately 26 C. Fish held at 35 C demonstrated a negative growth rate. The average 96-hr low temperature TL sub 50 values (median tolerance limit) varied from 1.6 to 10.1 C for smallmouth bass acclimated to 15 and 26 C, respectively. Intermediate values were obtained for acclimated to 18 to 22 C. An important aspect of the study was the occurrence of a secondary fungous infection on the fish after 96-hr exposure to cold temperatures. In some cases the infection was severe enough to cause complete mortality within 7 days. (Holoman-Battelle)
W73-15101

YOLK-SAC MALFORMATION IN PACIFIC SALMON IN RELATION TO SUBSTRATE, TEMPERATURE, AND WATER VELOCITY,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
H. Emadi.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1249-1250, August 1973. 1 fig, 1 tab, 7 ref.

Descriptors: *Environmental effects, *Salmon, Chum salmon, Pink salmon, Sockeye salmon, Chinook salmon, Coho salmon, Embryonic

growth stage, Water temperature, Animal growth, Juvenile fish, Fish eggs, Gravels, Fish physiology, Velocity.
Identifiers: *Alevins, *Pacific salmon, *Teratogenicity, Yolk sac, *Embryonic development, Water velocity, Substrates, Oncorhynchus keta, Oncorhynchus gorbuscha, Oncorhynchus nerka, Oncorhynchus tshawytscha, Oncorhynchus kisutch, Hybrids.

Results are reported for the studies of yolk-sac malformation in five species of Pacific salmon and two salmon hybrids to clarify the possible roles of substrate, water temperature, and water velocity in frequency of occurrence of the condition. Chum (Oncorhynchus keta), pink (O. gorbuscha), sockeye (O. nerka), and hybrid (pink x chinook) salmon alevins were susceptible to yolk-sac malformation when provided a smooth substrate as in standard hatchery incubators, at 12 C and a water velocity of 100 cm/hr. Chinook (O. tshawytscha) and coho (O. kisutch) alevins were not susceptible. In sockeye, malformations increased with increase in temperature from 8 to 12 and 14 C and, at 14 but not at 12 C, with increase in water velocity from 25 to 400 cm/hr. Replacement of the smooth substrate with a rough (gravel) substrate usually prevented the condition. (Holoman-Battelle)
W73-15102

TRANSPORT, DISTRIBUTION, AND DEGRADATION OF CHLORINATED HYDROCARBON RESIDUES IN AQUATIC MODEL ECOSYSTEMS,
Lund Univ. (Sweden). Dept. of Animal Ecology.
For primary bibliographic entry see Field 05B.
W73-15103

INVERTEBRATE MOVEMENTS AND SOME DIEL AND SEASONAL CHANGES IN A SIERRA NEVADA PEATLAND,
California Univ., Berkeley. School of Forestry and Conservation.
D. C. Erman.
Oikos, Vol 24, No 1, p 85-93, 1973. 7 fig, 2 tab, 22 ref.

Descriptors: *Dissolved oxygen, *Diel migration, *Diptera, *Oligochaetes, *Peat, *Bogs, Seasonal, Aerobic conditions, Water levels, Separation techniques, Water analysis, Benthic fauna, Sampling, Distribution patterns, Vertical migration, *California.
Identifiers: Ion selective electrodes, Macroinvertebrates, Chironomids, Mesenchytraeus, Kincaidiana freidris, Biting midges, *Mason Bog (Calif).

The objectives were to measure diel and seasonal changes in oxygen saturation, water temperature, water level, and aerobic limit in a Sierra Nevada peatland, and to study invertebrate migration in response to the diel changes. Oxygen saturation, determined with an oxygen electrode at 2 cm, varied from a mid-afternoon minimum (35-44 percent) to a maximum before sunrise (83-96 percent), especially in July and August. This finding has not been previously reported for peatlands. Aerobic limit was determined from redwood stakes that were stained when oxygen was absent. Minimum aerobic limit occurred in July (4.8 cm plus or minus 0.43 cm) and maximum (18.8 cm plus or minus 1.48 cm) occurred in November. The seasonal change in aerobic limit was not related to water levels since the water table was at the surface each day. Organisms were extracted from peat collected at 6-hour intervals by placing cores in funnels which were flooded with water and connected to Erlenmeyer flasks. As the cores were heated by lights above the funnel, the organisms moved down into the flask. Dipterans (Chironomidae and Heleidae) showed no change in vertical distribution over a 24-hr period, but oligochaetes appeared to have a diel migration. Oligochaete vertical distribution was negatively correlated with surface water temperature. (Little-Battelle)
W73-15105

GROWTH AND TOXICITY TESTS ON THE MARINE NANOPLANKTONIC ALGA PLATYMONAS TETRATHELE G.S. WEST IN THE PRESENCE OF CRUDE OIL AND EMULSIFIERS,
Brussels Univ. (Belgium). Laboratorium voor Ekologie en Systematiek.
F. Mommaerts-Billiet.
Environmental Pollution, Vol 4, No 4, p 261-282, June 1973. 11 fig, 2 tab, 16 ref.

Descriptors: Water pollution effects, *Phytoplankton, *Plant growth, Plant morphology, *Chlorophyta, Laboratory tests, *Phytotoxicity, Marine algae, Bioassay, Cytological studies, Nannoplankton, Environmental effects, Electron microscopy, *Emulsifiers, Protozoa, Growth rates, Oil pollution, Toxicity, Mortality, Plant physiology.
Identifiers: *Crude oil, *Platymonas tetrathele, Nonionic emulsifers, Finasol SC, Finasol OSR1, Flagellates, Libyan crude oil, Mixtures, Weathered crude oil, Oil dispersants.

The nanoplanktonic flagellate Playmonas tetrathele was used as a test organism in determining the response of phytoplankton to environmental pollution by crude oil and industrial non-ionic emulsifiers. Pure products and various mixtures were added to fresh media just before subculturing from a stock culture of Platymonas. The concentrations used were 5, 10, 25, 50, 100, 250 and 500 ppm; there was no duplication of cultures. In a second experiment all tests were made at 100 ppm with triplicate cultures. Cultures poisoned with an emulsifier in an aromatic solvent exhibited a very long lag phase. Diminished growth rates were observed for all the products tested most of the time at concentrations above 50 ppm. The mixture showed a toxicity close to that of the emulsifier component at its concentration in the mixture and lower than that of the crude oil alone. Recovery of Platymonas cells was observed at all tested concentrations. Electron micrography of Platymonas cells of cultures polluted by emulsifier SC and by the mixture crude plus emulsifier SC have shown that, compared with controls, the surviving cells did not present any anatomical abnormality in the organelles or in the membranes. However, a long-term exposure to pollutants in the non-lethal range could induce irreversible modifications in the morphology or the physiology of the phytoplankton cells, or even induce mutations. On the other hand, the great variety of synthetic products dumped in the sea may cause more resistant forms to be selected. (Holoman-Battelle)
W73-15106

INFLUENCE OF MACRO-NUTRIENTS ON THE RELATIVE GROWTH OF WATER PLANTS IN THE QU'APPELLE LAKES,
Saskatchewan Univ., Regina. Dept. of Biology.
G. Jones, and D. R. Cullimore.
Environmental Pollution, Vol 4, No 4, p 283-290, June 1973. 2 fig, 4 tab, 12 ref.

Descriptors: Aquatic plants, *Submerged plants, *Phosphates, *Dominant organisms, *Canada, *Ecological distribution, Water quality, Environmental effects, *Nutrients, *Plant growth, Sago pondweed, Aquatic weeds, Water chemistry, Lake sediments, Water properties, Pondweeds, Carbon, Chemical analysis, Soil analysis, Water analysis, Cheical properties, Hardness (Water), Biological properties, Speciation.
Identifiers: *Qu'Appelle Lakes, *Macrophytes, Hornwort, American milfoil, Buffalo Pound Lake, Last Mountain Lake, Pasqua Lake, Echo Lake, Mission Lake, Katepwa Lake, Crooked Lake, Ceratophyllum demersum, Myriophyllum exalbescens, Potamogeton pectinatus, Potamogeton richardsonii, Potamogeton vaginatus, Kjeldahl nitrogen, Organic carbon, Chlorophyll a.

An extensive survey of the percentage abundance of water plants in different lakes of the Qu'Appelle basin system in Saskatchewan has revealed a possible link between the dominant species and the total phosphate level in the water. Eleven sites in the Qu'Appelle lakes were sampled for macrophytes just as the weed inflorescences were appearing above the surface of the water. Chemical studies were made of the water and sediments according to standard methods. Five species of plants were considered to be dominant or codominant in the lakes studied: Ceratophyllum demersum, Myriophyllum exalbescens, Potamogeton pectinatus, Potamogeton richardsonii, and P. vaginatus; the predominant plants were, however, P. pectinatus and P. richardsonii. Ceratophyllum sp. was located only where there was less than 0.5 ppm total phosphate; Potamogeton richardsonii was frequently dominant in these regimes. At higher phosphate concentrations, Potamogeton pectinatus was found to be dominant and Ceratophyllum sp. absent. This study supports the findings of Fitzgerald (1970) that the aquatic plants are dependent on phosphates from the water and that phosphates 'tide up' in sediments are not so readily available, even though present in very high concentrations. (Holoman-Battelle)
W73-15107

ABUNDANCE, DISTRIBUTION AND OIL BIODEGRADATION POTENTIAL OF MICROORGANISMS IN RARITAN BAY,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. M. Atlas, and R. Bartha.
Environmental Pollution, Vol 4, No 4, p 291-300, June 1973. 3 fig, 5 tab, 19 ref.

Descriptors: *Microbial degradation, *Marine microorganisms, *Ecological distribution, *Bioindicators, Monitoring, Gas chromatography, Sea water, Water temperature, Oil pollution, Biodegradation, Water sampling, Cultures, Salinity, Variability.
Identifiers: *Raritan Bay, *Substrate utilization, *Crude oil, Enumeration, Fate of pollutants, Sweden crude oil, South Louisiana crude oil, Trace levels, Mineralization, Biomonitoring, Most probable number test, Carbon dioxide evolution, Seasonal variation.

Using an improved enumeration technique, the abundance of oil degrading microorganisms was monitored in Raritan Bay during a one-year period. The determined numbers varied from a low of 20/1 to a high of 3400/1 of surface sea water. The abundance of oil-degrading microorganisms was positively correlated with existing patterns of low-level oil pollution and with the water temperature, but was independent of total microbial counts. All tested sea water samples contained an adequate microbial population to cause the extensive biodegradation of added Sweden crude oil within eighteen days. The number of oil-degrading microorganisms in sea water samples was found to be a useful and sensitive indicator of low-level oil pollution that escaped routine gas chromatographic detection. (Holoman-Battelle)
W73-15108

TUBIFICIDS AND WATER QUALITY: A REVIEW,
Central Electricity Generating Board, Ratcliffe-on-Soar (England). Freshwater Biology Unit.
R. J. Aston.
Environmental Pollution, Vol 5, No 1, p 1-10, July 1973. 3 fig, 51 ref.

Descriptors: *Tubificids, *Water quality, *Water pollution, *Bioindicators, *Reviews, *Organic wastes, Water pollution effects, Oligochaetes, Annelids, Dissolved oxygen, Oxygen sag, Invertebrates, Heavy metals, Animal physiology, Insecticides, Thermal pollution, Natural streams, Wood preservatives (Pesticides), Fungicides, Embryonic

growth stage, Mature growth stage, Resistance, Dominant organisms, Anaerobic conditions, Respiration, Aquatic animals, Copper, Reproduction, Chlorinated hydrocarbon pesticides, Sewage effluents, Lake Michigan, Tripical regions, Ions, DDT, Laboratory tests, Condensers, Effluents, Heated water, Environmental effects, Benthic fauna, Thermal stress, Animal growth.
Identifiers: Population density, Enrichment, BHC, Macroinvertebrates, Derwent River, Ryacodrilus coccineus, Aulodrilus pleuriseta, Sensitivity, Potamothrix hammoniensis, Tubifex tubifex, Psammoryctes barbatus, Limnodrilus claparedianus, Limnodrilus udekemianus, Limnodrilus hoffmeisteri, Tubifex kessleri, Aulodrilus americanus, Peloscolex ferox, Potamothrix moldaviensis, Branchiura sowerbyi, Green Bay, Respiratory rates, Oxygen consumption, Pentachlorophenate, Trent River, Ivankovskoe Reservoir, Embryonic development, Red Cedar River.

In conditions of low dissolved oxygen concentrations prevalent in water bodies receiving heavy sewage pollution, Limnodrilus hoffmeisteri and Tubifex tubifex predominate and other species are eliminated in a rough sequence, dependent on the level of pollution. The respiratory physiology of some species is adapted to operate at very low oxygen concentrations and they are able to survive for long periods in anaerobic conditions. The reproductive rate of L. hoffmeisteri is also unaltered by a decrease in dissolved oxygen to very low concentrations. Heavy ions, such as copper, are likely to eliminate tubificids, but the insecticide BHC may cause an increase in tubificids while other aquatic invertebrates are eliminated. Warm condenser effluents are likely to increase the abundance of L. hoffmeisteri and, in some cases, provide suitable conditions for colonization by the exotic tubificid, Branchiura sowerbyi. An evaluation is made of the possible use of tubificids as indicators of water quality. (Holoman-Battelle)
W73-15109

USE OF THE HETEROTROPHIC ACTIVITY TECHNIQUE AS A MEASURE OF EUTROPHICATION,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
J. W. Wentworth.
Environmental Pollution, Vol 5, No 1, p 59-72, July 1973. 7 fig, 2 tab, 7 ref.

Descriptors: Aquatic environment, *Eutrophication, *Bioindicators, Rivers, *Canada, *Measurement, *Water pollution, *Water quality, Radioactivity techniques, Laboratory tests, Biochemical oxygen demand, Trophic level, Natural streams, Nutrients, Coliforms, Aquatic bacteria, Absorption, Organic matter.
Identifiers: *Heterotrophy, Heterotrophic bacteria, Substrate utilization, Mineralization, Data interpretation, Fate of pollutants, Glucose, Soluble organic carbon, Particulate organic carbon, Capilano River, Chilliwack River, Fraser River, Serpentine River, Nicomekl River, Michaelis-Menten equation, Enumeration, Particulate nitrogen.

An examination has been made of the relationship between the heterotrophic activity of the indigenous microflora of several waters and the various parameters used to measure eutrophication. Two-liter water samples collected in sterile flasks from the Capilano, Chilliwack, Fraser, Serpentine and Nicomekl Rivers in British Columbia were analyzed for heterotrophic activity, the numbers of heterotrophic bacteria, the concentrations of particulate carbon and nitrogen, soluble carbon, BOD, and total coliform. Heterotrophic activity determination was based upon the uptake and mineralization of C-14-labelled glucose by the heterotrophic microflora of the aquatic environments. The data were analyzed by Michaelis-Menten enzyme kinetics equations. The heterotrophic microbes of the waters studied displayed linear utilization of added radioactive glucose as a function of time. Glucose uptake and mineralization rates conformed to the kinetic models. This heterotrophic activity correlated well with the viable heterotrophic bacterial count, soluble and particulate carbon, and nitrogen concentrations but not BOD values. The data suggest that the waters tested may be ranked in order of nutrient enrichment by use of the heterotrophic activities they display. The employment of this technique to analyze river waters for nutrient content when several chemical analyses show little significant differences is discussed. (Holoman-Battelle)
W73-15110

SYNERGISM OF INSECTICIDES BY HERBICIDES,
Wisconsin Univ., Madison. Dept. of Entomology.
E. P. Lichtenstein, T. T. Liang, and B. N. Anderegg.
Science, Vol 181, No 4102, p 847-849, August 1973. 1 fig, 2 tab, 10 ref.

Descriptors: *Bioassay, *Pesticide toxicity, *Insecticides, *Herbicides, DDT, Mosquitoes, 2 4-D, Dieldrin, Chlorinated hydrocarbon pesticides, Phosphothioate pesticides, Triazine pesticides, Urea pesticides, Monuron, Diazinon.
Identifiers: *Synergism, Atrazine, Simazine, Carbofuran, Parathion, Paraoxon, Diazoxon, Dyfonate, Dyfoxon, Phorate, Phorate sulfoxide, Phorate sulfone, House flies, Fruit flies, Drosophila melanogaster, Musca domestica, Aedes aegypti, Flies, p p'DDT.

The herbicides atrazine, simazine, monuron, and 2,4-D enhanced the toxicity of selected insecticides to Drosophila melanogaster Meigen, Musca domestica L., and larvae of Aedes aegypti L. The insecticides - nine organophosphorus compounds, two chlorinated hydrocarbons, and one carbamate - were used at dosages that resulted in low insect mortalities, while the herbicides by themselves were nontoxic. Atrazine was most effective. With increasing amounts of this herbicide and constant amounts of some insecticides, increasing mortalities of fruit flies were observed. Exposure of the insects for 24 hours to carbofuran (0.5 microgram), p,p'-DDT (4 micrograms), parathion (0.35 microgram), and diazinon (0.2 microgram) alone resulted in mortalities of 7.5, 9.5, 8, and 10.5 percent, respectively. Based on dosage mortality curves obtained with increasing amounts of atrazine, mortalities of 50 percent of the insect populations would have been achieved with 23, 40, 6, and 10 micrograms of atrazine added to the above-mentioned dosages of carbofuran, DDT, parathion, and diazinon, respectively. (Little-Battelle)
W73-15112

LIGHT AND ELECTRON MICROSCOPE STUDIES OF DIATOM SPECIES BELONGING TO THE GENUS CHAETOCEROS EHRENBERG. I. CHAETOCEROS SEPTENTRIONALE OESTRUP,
Texas Univ., El Paso. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W73-15113

SENSITIVITY OF DUNALIELLA AND SCENEDESMUS (CHLOROPHYCEAE) TO CHLORINATED HYDROCARBONS,
California State Univ., San Diego. Dept. of Biology.
E. J. Luard.
Phycologia, Vol 12, Nos 1/2, p 29-33, June 1973. 2 tab, 14 ref.

Descriptors: *Chlorophyta, *Phytoplankton, Resistance, Laboratory tests, DDT, DDE, DDD, Polychlorinated biphenyls, Inhibition, Absorption, Aquatic algae, Marine algae, Insecticides, Chlorinated hydrocarbon pesticides, Cytological studies, Radioactivity techniques, Bioassay, Chrysophyta, Pyrrophyta, Dinoflagellates, Cyanophyta, Barley, Euglenophyta, Rhodophyta, Diatoms.
Identifiers: *Scenedesmus quadricauda, *Dunaliella tertiolecta, *Sensitivity, *Chlorinated hydrocarbons, C-14, Aroclor 1254, Spinach, Coccolithophores, Skeletonema costatum, Coccolithus huxleyi, Cyclotella nana, Monochrysis lutheri, Cylindrotheca closterium, Thalassiosira spp, Phaeodactylum tricornutum, Peridinium trochoideum, Dunaliella euchlora, Amphidinium carteri, Pyramimonas spp, Codium fragile, Chaetomorpha area, Chlorella spp, Protococcus spp, Oedogonium, Chlamydomonas reinhardtii, Microcystis aeruginosa, Anabaena cylindrica, Euglena gracilis, Porphyridium.

Dunaliella tertiolecta and Scenedesmus quadricauda, two algal species with quite different morphological characters, were tested for resistance to chlorinated hydrocarbons, as measured by carbon-14 uptake. The purpose of such tests was to determine the significance of cell barriers in confering resistance to chlorinated hydrocarbons. Young, rapidly dividing cells were exposed to 0.1-1000 ppb concentrations of the hydrocarbons in flasks to which were added sodium C-14-bicarbonate and unlabeled sodium bicarbonate. C-14 fixation by the cells was determined by liquid scintillation using a xylene based scintillation fluor. Both species were found to be resistant to 2,2,-bis (p-chlorophenyl)-1,1,1-trichloroethane (DDT) and its analogs (1000 ppb), but sensitive to polychlorinated biphenyl (PCB); Scenedesmus at 0.1 ppb, and Dunaliella at 100 ppb. A literature summary is included concerning inhibition of plants by chlorinated hydrocarbons. (Holoman-Battelle)
W73-15114

GROWTH OF DICTYOSPHAERIUM, SELENASTRUM, AND SCENEDESMUS (CHLOROPHYCEAE) IN A DILUTE ALGAL MEDIUM,
Connecticut Univ., Storrs. Biological Sciences Group.
F. R. Trainor, and L. E. Shubert.
Phycologia, Vol 12, Nos 1/2, p 35-39, June 1973. 4 tab, 14 ref.

Descriptors: *Growth rates, *Cultures, Bioassay, Light, *Chlorophyta, Rivers, Nutrients, *Scenedesmus.
Identifiers: *Dictyosphaerium, *Selenastrum, Culture media, Dilute media, Bristol's medium.

The growth of Scenedesmus, Dictyosphaerium, and Selenastrum was examined in a dilute medium with a total of 28.5 mg/l inorganic salts and in river water. Algae were grown in stationary culture in 50 ml flasks or on a roller tube rotator at 14 rpm in test tubes at 22C. Growth was measured by direct cell counts and with a colorimeter. Routinely, an actively growing inoculum was used, sufficient to give an initial cell concentration of approximately 200,000 cells/ml; this was adequate for colorimeter readings. Diurnal light of 3200 lux intensity was used throughout. Each day, after a determination of growth, the culture was transferred, by dilution to the original cell number. Some cultures were grown in this way for several weeks, and a uniform daily increment in growth is reported for 10-day experiments. Using this technique similar growth rates were recorded in sterile-filtered river water used as a medium. Stock cultures can be held in dilute media for several weeks, by first establishing a healthy population, and then maintaining the culture under minimal conditions, usually light at 160-215 lux. Scenedesmus and Dictyosphaerium were cultured in the dilute medium and showed doublings of 1 plus/day. Growth of Selenastrum was compared in one experiment. Results with the dilute medium compared favorably with those for Bristol's medium. (Little-Battelle)
W73-15116

WAX ESTERS IN TROPICAL ZOOPLANKTON AND NEKTON AND THE GEOGRAPHICAL DISTRIBUTION OF WAX ESTERS IN MARINE COPEPODS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-15117

COLUMBIA RIVER THERMAL EFFECTS STUDY: REACTOR EFFLUENT PROBLEMS,
Battelle Memorial Insti., Richland, Wash. Pacific Northwest Labs.
C. D. Becker.
Journal Water Pollution Control Federation, Vol 45, No 5, p 850-869, May 1973. 15 fig, 45 ref.

Descriptors: *Thermal stress, *Columbia River, *Environmental effects, *Salmonids, *Thermal powerplants, *Water pollution, *Reviews, Heated water, Fish diseases, Fish behavior, Invertebrates, Fish populations, Heat resistance, On-site investigations, Laboratory tests, Thermal pollution, Spawning, Predation, Water temperature, Food habits, *Thermal pollution.
Identifiers: Survival, Data interpretation, Sonic tracking, Steelhead trout, Pacific salmon, Salmo gairdneri, Oncorhynchus spp, Oncorhynchus tshawytscha, Oncorhynchus kisutch, Median tolerance limit, Oncorhynchus nerka, Gas bubble disease, Columnaris disease, Limpets, Chondrococcus columnaris, Catostomus macrocheilus, Fisherola nuttalli.

Thermal studies of the environmental impact of heated discharges from thermo-electric power plants, nuclear and fossil-fueled, are passing through a decisive phase. The Columbia River (Wash.) thermal effects study utilized the expertise, programs, and facilities of three agencies in order to focus on thermal problems peculiar to the Columbia River during 1968-70. The studies dealt with (a) spawning populations of adult and migration timing of juvenile chinook salmon, (b) sonic tracking of adult salmonids past heated reactor discharges, (c) thermal resistance of adult salmonids, (d) passage of juvenile salmonids through reactor discharge plumes, (e) equilibrium loss and ecological death of juvenile salmonids from thermal shock, (f) thermal shock and predation on juvenile salmonids, (g) food and feeding of juvenile chinook salmon, (h) rearing temperatures and artificial propagation, (i) gas-bubble disease of salmonids, (j) columnaris disease in Columbia River fish, and (k) effects on Columbia River invertebrates. (Holoman-Battelle)
W73-15118

EFFECT OF SKF-525A ON BRAIN ACETYLCHOLINESTERASE INHIBITION BY PARATHION IN FISHES,
Mississippi State Univ., State College. Dept. of Zoology.
J. R. Gibson, and J. L. Ludke.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 140-142, March 1973. 1 tab, 6 ref.

Descriptors: *Bioassay, *Sunfishes, *Shiners, *Pesticide toxicity, Phosphothioate pesticides, Inhibition, Animal physiology.
Identifiers: *Parathion, *SKF-525A, Antagonists, Acetylcholinesterase, Lepomis cyanellus, Lepomis macrochirus, Notemigonus crysoleucas.

Golder shiners (Notemigonus crysoleucas), green sunfish (Lepomis cyanellus), and bluegill sunfish (L. macrochirus) with no prior exposure to pesticides were used to study the effect of SKF-525A on Parathion toxicity as determined by brain ACHE activity. After acclimation, the fish were exposed to 1 ppm SKF-525A for 24 hours then to 200 ppm parathion for 10 hours. At the end of the exposure, test and control fish were sacrificed and ACHE activity determined. From the results, it is concluded that SKF-525A pretreatment affords significant protection against parathion inhibition of brain ACHE in the golden shiner and green sunfish, but not in bluegill sunfish. (Little-Battelle)
W73-15119

SOME PHYSIOLOGICAL ASPECTS OF SUBLETHAL HEAT STRESS IN THE JUVENILE STEELHEAD TROUT (SALMO GAIRDNERI) AND COHO SALMON (ONCORHYNCHUS KISUTCH),
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
G. Wedemeyer.
Journal of the Fisheries Research Board of Canada, Vol 30, No 6, p 831-834, June 1973. 5 fig, 10 ref.

Descriptors: *Thermal stress, *Fish physiology, *Coho salmon, *Juvenile fish, *Laboratory tests, Water temperature, Acid-base equilibrium, Cold-water fish, Vitamins, Hydrogen ion concentration, Bioassay, Chemical properties, Biological properties, Water pollution effects, *Thermal pollution.
Identifiers: *Steelhead trout, Biochemical tests, Biochemical characteristics, Blood, Salmo gairdneri, Oncorhynchus kisutch, Plasma, Acclimatization.

The physiological stress and recovery times required were compared when hatchery-reared juvenile coho salmon and steelhead trout acclimated to 10C were subjected to a rapid, sublethal increase (3 min) to 20C and then held at that temperature. Groups of 70 fish were used and subsamples of 10 fish were taken at 0, and 1, 3, 5, 24, 48, and 72 hr. Biochemical analyses of blood samples for interrenal vitamin C levels, plasma bicarbonate, pH, Ca, chloride, cholesterol, glucose, hemoglobin, total protein, and oxygen consumption were carried out. The rapid temperature increase was found to impose a greater stress on juvenile coho salmon than on juvenile steelhead trout. Both species suffered hyperglycemia, hypocholesterolemia, increased blood hemoglobin, and decreased blood sugar regulatory precision, but the steelhead recovered more quickly. Acid-base equilibrium was essentially unaffected, and only the coho suffered any significant interrenal vitamin C depletion. Vitamin C normalization required about 24 hr. (Holoman-Battelle)
W73-15121

AN IN SITU METHOD FOR MEASURING PRIMARY PRODUCTIVITY OF ARCTIC SEA ICE ALGAE,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05A.
W73-15122

MERCURY IN SEALS FROM EASTERN CANADA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05B.
W73-15123

EFFECTS OF BRIEF TEMPERATURE INCREASES ON LARVAE OF THE AMERICAN OYSTER (CRASSOSTREA VIRGINICA),
Virginia Inst. of Marine Science, Gloucester Point.
R. J. Diaz.
Jouranl of the Fisheries Research Board of Canada, Vol 30, No 7, p 991-993, July 1973. 1 fig, 1 tab, 3 ref.

Descriptors: *Temperature, *Growth rates, *Larvae, Environmental effects, Larval growth stage, Mollusks, Invertebrates, Mortality, Animal growth, *Thermal stress, *Oysters, *American oyster, Macroinvertebrates, Crassostrea virginica, Data interpretation.

Temperature increases effected with a heat exchanger consisting of an entrainment tube in a constant temperature bath were studied in relation to their effects on American oyster larvae. To estimate growth and mortality, two 1-ml subsamples of larvae were taken 48 hr after the temperature increase and then at 4-day intervals. The length of 40 live larvae were measured and all living larvae counted. The data were then analyzed statistically. Growth of larvae was not affected by brief temperature increases of 10 to 15 degrees C, but a 20 degree increase had a detrimental effect. Mortality increased significantly following all temperature increases. Setting rates of larvae receiving 15 to 21 degree increases were significantly lower. Growth rate, mortality, and setting also seemed to be affected by the age at which larvae received a thermal shock. (Holoman-Battelle)
W73-15124

COMPARISON OF MICROHABITATS OF MACROSCOPIC SUBALPINE STREAM ALGAE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
B. C. Parker, G. L. Samsel, Jr., and G. W. Prescott.
The American Midland Naturalist, Vol 90, No 1, p 143-153, July 1973. 2 fig, 4 tab, 25 ref.

Descriptors: *Aquatic algae, *Ecological distribution, *Aquatic habitats, *Montana, Rocks, *Environmental effects, Ecology, Chrysophyta, Chlorophyta, Rhodophyta, Primary productivity, Photosynthesis, On-site tests, Laboratory tests, Light intensity, Water properties, Aquatic plants, Flow rates, Water temperature, Air temperature, Natural streams, Water analysis, Alkalinity, Hardness (Water), Iron, Sulfates, Silica, Nitrates, Phosphates, Chlorides, Hydrogen ion concentration, Sandstones, Chlorophyll, Limestones, Dolomite, Basalts.
Identifiers: *Subalpine streams, *Substrates, Deer Lick Creek, Bear Creek, Batrachospermum vagum, Batrachospermum testale, Monostroma quaternarium, Hydrurus foetidus, Ulothrix, Orthophosphates, Ammonium, Pyroxene-gabbro conglomerates, Argillaceous quartzites, Silicious argillite.

Comparative studies of the microhabitats of the algae Hydrurus foetidus, Monostroma quaternarium and two species of Batrachospermum have disclosed differences which apparently control the specific distribution of these algae within the same subalpine stream beds. Hydrurus attached primarily to sandstones in bright, direct sunlight and exhibited cytological deterioration, decreases in chlorophyll and rates of photosynthesis following 6 days' transfer to the dimmer nearby habitats of Batrachospermum vagum and B. testale. Batrachospermum, which attached to many rock types, grew only in shaded areas and exhibited rapid deterioration such as bleaching, reduction in chlorophyll and photosynthetic rates when moved to the brighter habitats of Hydrurus or Monostroma. Monostroma tolerated a wide range in light intensities, but showed exceptional specificity for iron-rich conglomerates. Monostroma thrived exclusively just below the water surface on the downstream sides of conglomerates with their holdfasts intimately associated with the black iron-rich mineral (s). These findings are documented by laboratory and field measurements and experiments. (Holoman-Battelle)
W73-15125

TOXICOLOGY OF PESTICIDES: RECENT ADVANCES,
Mount Sinai School of Medicine, New York.
K. Kay.
Environmental Research, Vol 6, No 2, p 202-243, June 1973. 6 tab, 324 ref.

Descriptors: *Pesticide toxicity, *Animal pathology, Animal metabolism, *Ecological distribution, *Human pathology, Laboratory tests, *Bioassay, *Reviews, Absorption, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Carbamate pesticides, Organophosphorus pesticides, Animal growth, Metal organic pesticides, Embryonic growth stage.
Identifiers: *Toxicology, Carcinogenicity, Bioaccumulation, Median tolerance limit, Mercurials (Pesticides), Enzymatic inhibitors, Teratogenicity, Metabolites, Biological magnification, Pollutant effects, Mutagenicity, Neurogenicity, Hexachlorophene, Captan, Methyl parathion, Carbaryl, Chlordane, Chlorophos, Mirex, Parathion, Toxaphene, Petroleum oil, Fuller's earth, Pyrophyllite, Kaolin, Bentonite, Calcium arsenate, Lead arsenate, Sodium chlorate.

A rather extensive review is presented which covers recent research findings on the toxicology of pesticides. The areas covered include (1) production and control legislation, (2) organic phosphates and carbamates, (3) chlorinated hydrocarbon pesticides, (4) mercury-containing pesticides, (5) bipyridyl herbicides, (6) toxicology of captan, (7) carcinogenic aspects of pesticide vehicles and carriers, and (8) distribution of pesticides in the environment. (Holoman-Battelle)
W73-15126

GROWTH AND CELL-SIZE DISTRIBUTION OF MARINE PLANKTONIC ALGAE IN BATCH AND DIALYSIS CULTURES,
Bedford Inst., Dartmouth (Nova Scotia).
A. Prakash, L. Skoglund, B. Rystad, and A. Jensen.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 143-155, February 1973. 8 fig, 3 tab, 23 ref.

Descriptors: *Cultures, *Marine algae, *Growth rates, *Size, Diatoms, Dinoflagellates, Phytoplankton, Chlorophyll, Distribution patterns, Bioassay, Dialysis, Pyrrophyta.
Identifiers: *Continuous cultures, Cyclotella nana, Skeletonema costatum, Thalassiosira, Phaeodactylum tricornutum, Gonyaulax tamarensis.

Unialgal cultures of Skeletonema costatum, Cyclotella nana, Thalassiosira sp., Phaeodactylum tricornutum, and Gonyaulax tamarensis were grown by batch and dialysis methods to examine differences in growth characteristics and cell-size distribution. Erlenmeyer flasks were used for the batch studies. Three variations were used in the dislysis cultures: continuous reservoir-filter dialysis; batch reservoir-filter dialysis; continuous reservoir-bag dialysis. Growth of algae was measured by monitoring changes in cell numbers and volumes with a Coulter Counter. An extended exponential growth phase and a higher maximum population characterized growth of planktonic algae in a dialysis system compared with that in a batch system. Algal cells grown in a dialysis culture had higher chlorophyll content and a larger average cell size than those grown in a batch culture. In both types of culture, changes in cell-size distribution were related to the phases of the growth cycle with maximum cell-size during the stationary phase. Various interactions of the component reactions of photosynthesis leading to changes in growth pattern and cell-size distribution are discussed. (Little-Battelle)
W73-15128

THE STRUCTURE AND DEVELOPMENT OF A FORM OF DINOCOCCUS OEDOGONII (GEITLER) FOTT,
E. G. Williams, and J. W. G. Lund.
Nova Hedwigia, Vol 23, Nos 2-3, p 493-513, 1972. 48 fig, 14 ref.

Descriptors: *Aquatic algae, *Plant morphology, *Plant growth, *Pyrrophyta, Systematics, Dinoflagellates.
Identifiers: *Dinococcus oedogonii.

Aform of Dinococcus oedogonii (Geitler) Fott is described. It shows considerable variability in cell shape, presence, absence and orientation of the apiculate poles and presence, position, or absence of an attaching disc. Reproduction is by gymnodinioid zoospores usually two per cell but sometimes one, or by autospores-two per cell. Colonies of 8 cells may be formed by repeated reproduction by autospores; they disintegrate as their cells reproduce by zoospores. Clones were followed and the variability of their cells and the methods of reproduction shown to be phenotypic and not genotypic. The unsatisfactory nature of the present systems of classification for the Dinococcales and the difficulties of identifying species, or even genera, are illustrated by reference to the alga described. (Holoman-Battelle)
W73-15129

BLUE-GREEN ALGAL FLORA OF RAJASTHAN,
Udaipur Univ. (India). Dept. of Botany.
R. S. Gupta.
Nova Hedwigia, Vol 23, Nos 2-3, p 481-492, 1972. 2 fig, 7 ref.

Descriptors: *Cyanophyta, *Aquatic algae, *Soil algae, *Speciation, *Systematics, *Ecological distribution, Environmental effects, Salt tolerance, Soil environment, Aquatic environment, Temperature, Plant growth, Salt marshes, Habitats.
Identifiers: *India (Rajasthan), Chroococcus, spp, Microcystis aeruginosa, Myxosarcina burmensis, Arthrospira platensis, Lyngbya spp, Oscillatoria spp, Phormidium faveolarum, Schizothrix vaginata, Spirulina laxissima, Hydrocoryne spongiosa, Tolypothrix spp, Dichothrix baueriana, Rivularia beccariana, Rivularia globiceps var. abuensis, Synechococcus elongatus, Aphanocapsa spp, Chroococcus turgidus, Microcoleus palludosus, Porphyrosiphon notarisii, Oscillatoria jasorvensis, Oscillatoria spp, Anabaena spherica, Phormidium molle, Anabaena spp, Oryzae, Aulosira spp, Gloeotrichia kurziana, Hapalosiphon luteolus, Sambher Lake.

Twenty-seven species of blue-green algae are reported from different localities and habitats of Rajasthan. A new variety of Rivularia globiceps has been described from Mt. Abu. The chief environmental factors and habitat conditions affecting growth of the algae have been outlined. The use of Anabaenopsis arnoldii as a fertilizer has been outlined. (Holoman-Battelle)
W73-15130

MICROFUNGI COLONIZING SUBMERGED STANDING CULMS OF PHRAGMITES COMMUNIS TRIN,
Nottingham Univ. (England). Dept. of Botany.
A. E. Apinis, C. G. C. Chesters, and H. K. Taligoola.
Nova Hedwigia, Vol 23, Nos 2-3, p 473-480, 1972. 5 tab, 9 ref.

Descriptors: *Aquatic fungi, *Isolation, *Systematics, Speciation, Aquatic plants, Grasses.
Identifiers: *Phragmites communis, *Reed grass, *Colonization, Culms, Ascomycetes, Hyphomycetes, Pyrenomycetes, Macrophytes, Micronectriella, Cerisporopsis, Helminthosporium dematioideum, Dictyuchus monosporus, Lasiosphaeria, Dictyosporium, Septoria arundinacea, Ophiobolus, Leptosphaeria culmifraga, Tritirachium, Wettsteinina niesslii, Stagonospora elegans, Passeriniella discors, Leptosphaeria arundinacea.

The mycoflora of submerged parts of standing culms of Phragmites communis consists mainly of Ascomycetes and Sphaeropsidales and is distinctly different from that of the aerial parts in which Hyphomycetes predominate. Sporulation of fungi on submerged parts does not begin until culms are moribund or dead, usually in the early spring after flowering. The commonest species of fungi colonizing submerged parts of culms near the water surface are different from those colonizing the mud covered parts deep below. Septoria arundinacea, Leptosphaeria arundinacea and Ophiobolus sp are common on the former while Wettsteinina niesslii and Dictyuchus monosporus are common on the latter parts. It is the fungi on the upper sections of the submerged parts of the host which possibly contribute to the weakening and eventual collapse of P. communis culms. (Holoman-Battelle)
W73-15131

MICROFUNGI COLONIZING COLLAPSED AERIAL PARTS OF PHRAGMITES COMMUNIS TRIN. IN WATER,
Nottingham Univ. (England). Dept. of Botany.
T. K. Taligoola, A. E. Apinis, and C. G. C. Chesters.
Nova Hedwigia, Vol 23, Nos 2-3, p 465-472, 1972. 6 tab, 5 ref.

Descriptors: *Aquatic fungi, *Isolation, *Seystematics, Aquatic plants, Decomposing organic matter, Leaves, Speciation, Grasses.
Identifiers: *Colonization, *Phragmites communis, *Reed grass, Stems, Debris, Hyphomycetes, Ascomycetes, Culms, Leaf litter, Pyrenomycetes, Macrophytes, Lasiosphaeria, Wettsteinina niesslii, Micronectriella, Leptosphaeria spp., Diplodina, Septoria arundinacea, Alternaria tenuis, Dictyosporium, Dactylella, Tritirachium, Dictyuchus monosporus, Hendersonia crastophila, Stagonospora elegans, Papularia arundinis, Phoma, Hunicola fuscoatra var. fuscoatra, Acrotheca, Helotium citrinulum, Helminthosporium dematioideum, Cladosporium herbarum, Dactylaria, Ceriosporopsis spp, Thielavia, Dasyscyphus spp, Passeriniella discors, Diplodina arundinacea, Didymella, Hendersonia spp.

The aerial parts of Phragmites communis Trin. after collapsing and being submerged, eventually lose their original aerial mycoflora dominated by Hyphomycetes and a few Ascomycetes and are subsequently colonized by aquatic fungi which include certain Ascomycetes, Sphaeropsidales, aquatic Hyphomycetes and other fungi. This colonization takes place in two main stages. During the first stage the aerial fungi, such as Alternaria tenuis, still persist on the floating stems, and the leaf litter mycoflora is characterized by Diplodina sp. During the second stage aquatic Ascomycetes, such as Leptosphaeria culmifraga and Hyphomycetes, such as Articulospora sp., appear at an increasing frequency on the litter at the bottom of the pond. (Holoman-Battelle)
W73-15132

AQUATIC FUNGI FROM AN ANTARCTIC ISLAND AND A TROPICAL LAKE,
Freshwater Biological Association, Ambleside (England).
L. G. Willoughby.
Nova Hedwigia, Vol 22, Nos 1-2, p 469-488, 1971. 112 fig, 31 ref.

Descriptors: *Aquatic fungi, Antarctic, *Soil fungi, *Systematics, Plant morphology, Cultures, Aquatic environment, Isolation, Speciation, Lakes, Freshwater, Water sampling, Plant growth, Water temperature, Soil temperature, Cold regions, Tropical regions.
Identifiers: *Uganda (Lake George), *Antarctia (Signy Island), Phycomycetes, Oomycetes, Rhizophydium signyense, Aphanomyces, Hypochytrium catenoides, Lagenidium giganteum, Pythium, Catenaria angullulae, Rhizophlyctis rosea, Rhizophlyctis ingoldii, Nowakowskiella hemisphaerospora, Nowakowskiella elegans, Catenophlyctis variabilis, Allomyces anomalus, Achyla recurva, Chytridium proliferum, Chytriomyces willoughbi, Phlyctochytrium acuminatum, Rhizophydium pollinis-pini.

In a study of aquatic fungi from Signy Island, Antarctia and Lake George, Uganda, freshwater lake sampling yielded Aphanoyces sp., Hyphocytrium catenoides and Lagenidium giganteum from the former and Catenaria anguillulae and Chytridium proliferum from the latter. C. anguillulae appears to be a particularly dominant and nutritionally versatile fungus in Lake George. Soil samples from Signy Island gave a previously undescribed species, Rhizophydium signyense, saprophytic on chitinous materials. (Holoman-Battelle)
W73-15134

BERYLLUM UPTAKE BY THE COMMON GUPPY USING RADIOISOTOPE BE-7. I. PRELIMINARY STUDY: TRACER MECHANICS AND PROCEDURES,
Aerospece Medical Research Lab., Wright-Patterson AFB, Ohio.
F. C. Damm, and A. R. Slonim.
Available from the National Technical Information Service as AD-758 814. Final Report No. AMRL-TR-72-94, October 1972. 17 p, 4 fig, 2 tab, 6 ref. Project No. 6302.

Descriptors: *Tracers, *Absorption, *Methodology, *Beryllium, *Radioactivity techniques, Alkaline earth metals, Toxicity, Aqueous solutions, Freshwater fish, Pollutant identification.
Identifiers: *Guppy, Beryllium radioisotopes, Be-7, Scintillation counting, Half-life, Lebistes reticulatus, Path of pollutants.

The mechanics and several variables concerning the use of radioactive beryllium, Be-7, and the possible interaction between beryllium solutions and glass were studied prior to the application of the isotope (in follow-on phase) as a monitor of beryllium toxicity in guppies. Radioactivity was measured in a scintillation counter incorporating a sodium iodide well detector. Tracer activity or efficiency was evaluated under various conditions (e.g., isotope concentration, storage in glass over time, and counting geometry relative to sample size and position in detector). Tracer activity was proportional to tracer concentration and unaltered in a glass container for a period up to 8 days. Under the conditions of this study, beryllium was not lost from BeSO4 solutions in glass bioassay jars due to adsorption onto the glass or evaporation. Counting efficiency was relatively independent of sample size or position within well detector, so that water samples and exposed fish can be treated alike relative to the detector geometry. A procedure was outlined for estimating beryllium uptake in fish exposed to aqueous beryllium solutions to which tracer has been added. (See also W73-15136) (Holoman-Battelle)
W73-15135

BERYLLIUM UPTAKE BY THE COMMON GUPPY USING RADIOISOTOPE BE-7. II. BERYLLIUM CONCENTRATION IN FISH,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
A. R. Slonim, and F. C. Damm.
Available from the National Technical Information Service as AD-758 815. Final Report No. AMRL-TR-72-95, October 1972. 25 p, 12 tab, 5 ref, 2 append. Project No. 6302.

Descriptors: *Beryllium, *Toxicity, *Bioassay, *Radioactivity techniques, Absorption, Chemical analysis, Environmental effects, Kinetics, Freshwater fish, Monitoring, Fry, Path of Pollutants, Pollutant identification, Laboratory tests, Hardness (Water), Alkaline earth metals.
Identifiers: Bioaccumulation, *Guppy, *Lebistes retriculatus, Be-7, Animal tissues, Biological magnification, Beryllium radioisotopes, Median tolerance limit, Fate of pollutants, Kidneys, Intestine, Ovaries, Gills, Liver, Brain, Heart, Eyes, Spleen.

Two bioassays were conducted in which radioactive beryllium, Be-7, was added as a tracer to beryllium sulfate solutions in order to obtain some insight into beryllium toxicity in fish. Tracer mechanics and procedures for measuring beryllium uptake in guppies were determined in the previous phase. The bioassay data indicated that the amount of beryllium concentrated within the guppies (and fry) was influenced by the beryllium concentration in solution and by fish size (inversely), and to a less extent by exposure period, but not by fish age, buffering to the beryllium solution, or water hardness. Generally, beryllium uptake varied greatly among guppies exposed to the same enviromental conditions. Examination of individual tissues and organs of six of the guppies revealed that most of the beryllium was concentrated in the viscera; beryllium uptake was highest (per total organ) in the gastrointestine and kidney of the 9 organs analyzed provisionally. These studies suggest that the lethality of beryllium in fish is not dependent upon the amount concentrated within the fish, but more likely on the effect of beryllium on a particular target organ, cellular or subcellular component. More work is required to determine the mechanism of beryllium toxicity in fish. (See also W73-15135) (Holoman-Battelle)
W73-15136

EFFECTS OF OXYGEN PULPING ON TOXICITY AND COLOUR OF EFFLUENT,
For primary bibliographic entry see Field 05G.
W73-15188

A PRELIMINARY REPORT ON THE USE OF SEQUENTIAL COMPARISON INDEX TO EVALUATE ACID MINE DRAINAGE ON THE MACROBENTHOS IN A PRE-IMPOUNDMENT BASIN,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
G. M. Simmons, Jr.
Trans Am Fish Soc. Vol 101, No 4, p 701-713, 1972. Illus.
Identifiers: *Acid mine drainage, *Benthos, Colonization, Evaluation, Impoundments, Index, Molluscan, Mussels, *Virginia (North Anna River).

A 35 mile segment of the North Anna River, Virginia, is currently being impounded to provide cooling water for a nuclear reactor. The headwaters of a major tributary of the North Anna River, Contrary Creek, was the site of extensive pyrite mining operations at the turn of the century. Contrary Creek is a source of acid mine drainage, and confluences with the North Anna River approximately midway through the pre-impoundment basin. The sequential comparison method of establishing diversity indices of community structure was used to evaluate the effect of acid mine drainage on the macrobenthos in a 21.5 mile segment of the river. The diversity indices indicated that the North Anna River recovers from acid mine drainage approximately 19 miles below the entrance of Contrary Creek or 2 miles below the present dam site. However, the molluscan element, which occupied 32% of the macrobenthos at the upstream control station, did not show a reoccurrence within the study area below the discharge of Contrary Creek. The lack of mussel recolonization indicates that the river has only partially recovered from the acid drainage. Even though the Sequential Comparison Technique provides a rapid method of gathering numerical information regarding biological water quality, the technique as currently used does not exhibit sufficient resolution to distinguish between different degrees of biological recovery.--Copyright 1973, Biological Abstracts, Inc.
W73-15197

SOME DESMIDS FROM UGANDA,
Freshwater Biological Association, Ambleside (England).
E. M. Lind.
Nova Hedwigia, Vol 22, Nos 1-2, p 535-585, 1971. 193 fig, 28 ref.

Descriptors: *Chlorophyta, *Aquatic algae, *Systematics, *Ponds, Speciation, Plant morphology, Varieties.
Identifiers: *Uganda, *Desmids, Botryococcus, Oedogonium spp, Gonatozygon spp, Netrium digitus, Closterium spp, Pleurotaenium spp, Tetmemorus spp, Triploceras gracile var. robustum, Euastrum abruptum spp, Misrasterias spp, *Cosmarium spp, Arthrodesums mucronulatus, Xanthidium spp, Staurodesmus spp, Staurastrum spp, Sphaerozosma excavatum, Onychonema laeve, Hyalotheca dissiliens, Phymatodocis irregulare var. intermedium, Bambusina spp, Desmidium spp.

Collections of desmids were made in a series of pools in an extensively sandy area in Uganda between the Kampala-Masaka road and Lake Victoria. Descriptions of the taxa and species are given. (Holoman-Battelle)
W73-15208

SEASONAL FLUCTUATIONS OF AQUATIC MACROINVERTEBRATES IN OAKWOOD BOTTOMS GREENTREE RESERVOIR,
Tennessee Valley Authority, Norris.
W. A. Hubert, and J. N. Krull.
The American Midland Naturalist, Vol 90, No 1, p 177-185, July 1973. 4 tab, 15 ref.

Descriptors: Aquatic animals, *Tennessee, Crustaceans, Aquatic insects, Mollusks, Bottom sampling, Systematics, Annelids, Water chemistry, Biomass, Animal populations, Water level fluctuations, Fluctuations, Oligochaetes, Isopods, Invertebrates, Amphipoda, Crayfish, Dragonflies, Mites, Mayflies, Caddisflies, Water beetles, Diptera, Midges, Mosquitoes, Gastropods, Snails, Clams, Speciation, Ditches, Water temperature, Turbidity, Alkalinity, Dissolved oxygen, Hydrogen ion concentration, Conductivity, On-site investigations.
Identifiers: *Seasonal variation, *Macroinvertebrates, *Species diversity, *Species density, *Oakwood Bottoms Greentree Reservoir (Tenn), Flatworms, Water mites, Fairy shrimp, Turbellaria, Platyhelminthes, Leeches, Hirudinea, Anostraca, Eubranchipus serratus, Decapods, Scuds, Water boatmen, Water bugs, Spiders, Backswimmers, Flies, Snails, Fishflies, Beetles, Marsh flies, Horseflies, Sample preservation, Asellus forbesi, Lirceus fontinalis, Crangonyx forbesi.

The seasonal abundance and diversity of aquatic macroinvertebrates has been described within Oakwood Bottoms Greentree Reservoir. An 8-in diameter wire household sieve was used to collect the organisms during five surveys, each of which was made during different seasons of 1971. The samples were preserved in 70 percent ethyl alcohol for identification, counting and weighing. Biomass was calculated on a wet weight basis and included nonliving portions of invertebrates. The following physical and chemical parameters were measured at the study area: water temperature, turbidity, water level fluctuation, DO, pH, total alkalinity and conductivity. A large variety of macroinvertebrates occurred at Oakwood, with populations in permanent water areas (56 taxa) distinctly different from populations in areas with temporary water conditions (20 taxa). The greatest number and biomass of invertebrates occurred from November to April with fingernail clams, amphipods, isopods and pulmonate snails predominating. Sufficient quantities of macroinvertebrates are present to serve as a significant food source for waterfowl utilizing the Reservoir during spring and autumn migrations. (Holoman-Battelle)
W73-15209

A ZONAL LEAF SPOT OF WATERHYACINTH CAUSED BY CEPHALOSPORIUM ZONATUM,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. E. Rintz.
Hyacinth Control Journal, Vol 11, p 41-44, June 1973. OWRR B-011-FLA (11), 14-31-0001-3268.

Descriptors: *Plant pathology, Aquatic plants, *Water hyacinth, Biocontrol, *Aquatic weeds, *Florida, Plant diseases.
Identifiers: *Newnans Lake (Fla), *Zonal leafspot, *Cephalosporium zonatum.

A zonal leafspot of waterhyacinth (Eichhornia crassipes) originally found in Spring Bayou in Louisiana and subsequently in Newnans Lake in Florida was found to be caused by Cephalosporium zonatum. The disease is first evident as sunken lesions on the leaf blades. Lesions gradually enlarge and become distinctly zonate. Optimum temperature for disease development and in vitro growth of the pathogen was established at 25C. Identity of the pathogen as C. zonatum was based on morphology and host range. Under artificial conditions, the pathogen affected plants of 16 genera in 12 different families. Despite its apparently wide host range, it has not been reported to occur naturally on plants other than fig in the United States. Cephalosporium zonatum appears to have some potential in biocontrol of waterhyacinth and further studies are warranted. (Morgan-Florida)
W73-15226

APHANOMYCES BLIGHT OF AMAZON SWORD PLANTS,
Florida State Dept. of Agriculture and Consumer Services, Gainesville.
W. H. Ridings, and F. W. Zettler.
Phytopathology, Vol 63, No 2, p 289-295, February 1973. 2 fig, 1 tab, 20 ref. OWRR B-011-FLA (6), 14-31-0001-3268.

Descriptors: *Plant pathology, *Aquatic weeds, Biocontrol, *Florida, Plant diseases.
Identifiers: *Amazon sword plants, *Aphanomyces blight.

An aphanomyces sp. was frequently isolated from tissues of amazon sword plants (Echinodorus brevipedicellatus) affected by a previously unrecognized disease found at an aquatic plant nursery in South Florida. Suspensions of zoospores or mycelial fragments infected 28 of 45 inoculated plants of E. brevipedicellatus. Symptoms were the same as those observed under field conditions and on plants inoculated with water taken from containers with infected plants. The following alismataceous species did not become infected when inoculated: Echinodorus 'Rangerii', E. grisebachii, E. longistylis, E. martii, Sagittaria lorata, or S. sinensis. Likewise, inoculated specimens of Hydrilla verticillata, Myriophyllum spicatum, and Alternanthera philoxeroides remained healthy. The morphology of the oogonia, oospores, antheridia, and primary and secondary zoospores of this fungus was the same as that of published descriptions of A. euteiches and the two isolates of this species used for comparison. The amazon sword plant isolate infected seedlings of Pisum sativum, Beta vulgaris, Raphanus sativum, Vicia faba, and Vigna unguiculata (sinensis). Inoculated seedlings of Lycopersicon esculentum and Avena sativa did not become infected. The two A. euteiches isolates infected seedlings of P. sativum, but failed to infect B. vulgaris, R. sativum, A. sativa, L. esculentum, or E. brevipedicellatus. (Morgan-Florida)
W73-15227

ANTIMICROBIAL EFFECTS OF AQUATIC PLANTS FROM MINNESOTA,
Minnesota Univ., Minneapolis. Coll. of Pharmacy.
K. L. Su, Y. Abul-Hajj, and E. J. Staba.
Lloydia, Vol 36, No 1, p 80-87, March 1973. 1 tab, 1 fig, 18 ref. OWRR A-025-MINN (8).

Descriptors: *Aquatic plants, *Minnesota, Methodology, Isolation, Mycobacterium, Microorganisms, E. coli.
Identifiers: *Skellysolve F, Filter paper, Disc diffusion method, *Antimicrobial activity, Nymphaea spp, Sparganium fluctuans, Candida albicans.

The antimicrobial activity of plant extracts against animal (Staphylococcus aureus, Escherichia coli, Mycobacterium smegmatis and Candida albicans) and plant (Alternaria sp. and Fusarium roseum) microorganisms were detected by the filter paper disc diffusion method. Ethanol (80%) extracts of Nymphaea tuberosa and Nuphar variegatum were moderately active against S. aureus, and M. smegmatis. Skellysolve F extracts of N. variegatum and Sparganium fluctuans were active against C. albicans. Ethyl gallate was isolated and identified as the antimicrobial principle from Nymphaea tuberosa, which was active against Mycobacterium smegmatis. (Walton-Minnesota)
W73-15228

PRELIMINARY CHEMICAL STUDIES OF AQUATIC PLANTS FROM MINNESOTA,
Minnesota Univ., Minneapolis. Coll. of Pharmacy.
For primary bibliographic entry see Field 02H.
W73-15229

TOXICITY, ANTI-NEOPLASTIC, AND COAGULATION EFFECTS OF AQUATIC PLANTS FROM MINNESOTA,
Minnesota Univ., Minneapolis. Coll. of Pharmacy.
K. L. Su, and E. J. Staba.
Lloydia, Vol 36, No 1, p 99-102, March 1973. 3 tab, 6 ref. OWRR A-025-MINN (9).

Descriptors: *Aquatic plants, *Toxicity, *Minnesota, Coagulation.
Identifiers: *Anti-coagulants, Anti-neoplastics, Mice, *Nymphaea spp, *Nuphar spp.

Twenty two aquatic plants collected in Minnesota were relatively nontoxic. The most toxic plant extract in Swiss Webster mice was a 50% ethanol extract of Nymphaea tuberosa stem. Alkaloids from Nuphar luteum, Nuphar japonicum and Nymphaea alba also exhibit low toxicity. The combined Skellysolve F and chloroform extract of Nuphar variegatum was active against the amelanoma tumor. National Cancer Institutes' Drug Research and Development Branch screening results of 50% ethanol extracts from the 22 aquatic plants studied were essentially inactive using the 9KB-human epidermoid carcinoma of the nasopharynx system, LE-L1210 lymphoid leukemia strains. Ethanol (50%) stem extract of Nymphaea tuberosa had slight activity against the LE-L1210 lymphoid leukemia in CDF1 mice but was also toxic. Prolongation of mice prothrombin time (PT) was observed with 80% ethanol extracts of Carex lacustris, Eleocharis smallii, Myriophyllum exalbescens, Nuphar variegatum, Nymphaea tuberosa, Potamogeton natans, Potamogeton richardsonii, Potamogeton zosteriformis, Sagittaria latifolia and Zizania aquatica, whereas a slight shortening of PT was observed in the Skellysolve F and chloroform extracts of Carex lacustris, Myriophyllum exalbescens, Nuphar variegatum and Nymphaea tuberosa. (Walton-Minnesota)
W73-15230

SOURCES OF TRITIUM AND ITS BEHAVIOR UPON RELEASE TO THE ENVIRONMENT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W73-15234

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF VIRGIL C. SUMMER NUCLEAR STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15235

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF QUAD-CITIES NUCLEAR POWER STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15236

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF COOPER NUCLEAR STATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15237

GREAT LAKES RADIOECOLOGY,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-15239

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF TURKEY POINT PLANT, UNITS 3 AND 4.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15243

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-15246

ASSIMILATION AND RETENTION OF ZN65 BY THE MALLARD DUCK (ANAS PLATYRHYNCHUS),
Colorado Cooperative Wildlife Research Unit, Fort Collins.
For primary bibliographic entry see Field 05B.
W73-15248

OCCURRENCE OF RADIONUCLIDES IN THE EXOSKELETON OF TURTLES,
Mississippi State Coll. for Women, Columbus. Dept. of Physical Science.
For primary bibliographic entry see Field 05B.
W73-15249

UPTAKE AND RETENTION OF TUNGSTEN-181 BY CRAYFISH (CAMBARUS LONGULUS LONGEROSTRIS ORT.),
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W73-15250

FEEDING RATES AND FOOD UTILIZATION OF STREAM CADDISFLY LARVAE OF THE GENUS NEOPHYLAX (TRICHOPTERA:LIMNEPHILIDAE) USING COBALT-60 AND CARBON--14,
Pittsburgh Univ., Pa. Pymatuning Lab. of Ecology.
For primary bibliographic entry see Field 05B.
W73-15252

TURNOVER OF ZN65 IN OYSTERS,
Oregon State Univ., Corvallis. School of Oceanography.

. Cutshall.
vailable from NTIS, Springfield, Va., as RLO-227-T-12-36; $4.00 in paper copy, $1.45 in icrofiche. Report RLO-2227-T-12-36, 1972. 19 p, fig, 1 tab, 18 ref.

escriptors: *Oysters, *Zinc radioisotopes, *Absorption, *Mathematical models, Radioactivity chniques, Radioecology, Nuclear wastes, Path pollutants, Public health, Columbia River, stuarine environment, Food chains, Cycling utrients, Trace elements.

model with a single biological compartment was own to correlate data from long-term experients. The effective half-life of Zn65 in oysters ncluding combined effects from biological turover and radioactive decay) is about 135 days; he half-life for turnover of only the biological ompartment, about 300 days. The fit to a one-ompartment model indicates that the dominant rgans have similar long-term retentions. The ong-term experiments are relevant to chronic conamination situations and for study of the role of rganisms in trace-element cycling. If 4% of the otal Zn65 had an effective half-life of 1 day (the emainder, an effective half-life of 135 days) the hort-lived component would be dominant for the irst few days but would have small affect after 35 days. (Bopp-ORNL)
W73-15254

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket No. 50282-118; $10.60 per copy, $1.45 microfiche. Report No. Docket 50282-118, May 1973. 434 p, 34 fig, 69 tab, 142 ref.

Descriptors: *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Minnesota, Mississippi River, Tritium.
Identifiers: *Pressurized water reactors, *Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the continuation of construction permits and issuing of operation licenses of the Prairie Island Nuclear Generating Plant. The plant is located in Burnside Township, Minnesota, and has two pressurized-water reactors. The cooling system is operated in a closed-cycle mode receiving water from the Mississippi River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to continue the construction permits and issue operating licenses for the facility subject to the following conditions: (1) Define an environmental monitoring program to determine the effects of the plant; (2) provide an analysis of effect problems and propose a course of action to alleviate the problem; (3) follow specifications to operate the cooling system on a closed-cycle mode to the maximum extent practicable. (Houser-ORNL)
W73-15256

THE POPULATION DYNAMICS OF CHANNEL CATFISH, ICTALURUS PUNCTATUS (RAFINESQUE), IN THE LITTLE MISSOURI ARM OF LAKE SAKAKAWEA. BEFORE AND DURING COMMERCIAL EXPLOITATION, 1968-1971,
North Dakota Univ., Grand Forks. Dept. of Biology.
C. H. Wahtola, Jr.
Available from NTIS, Springfield, Va. 22151 as COM-72-11066 - Price $3.00 printed copy; $1.45 microfiche. PhD Thesis, December 1971. 126 p, 18 fig, 52 tab, 106 ref.

Descriptors: *Fish populations, *Channel catfish, *North Dakota, *Growth rates, Marking techniques, Surveys, Data collections, Agriculture, Fish management, Commercial fish, Biology, Ecosystems.
Identifiers: *Little Missouri River (N. Dak), Fish age determinations.

A population of channel catfish in the Little Missouri arm of Lake Sakakawea (Garrison Reservoir), North Dakota, was studied during the summers of 1968-71, to determine size, structure, growth characteristics and other vital parameters before and during commercial exploitation. A total of 4035 channel catfish were caught. The right pectoral spines from 671 to 701 fish taken in 1968 were cross-sectioned, and age determinations were made by counting annuli. During 1969-71, 2460 of 3334 fish captured were tagged and released. The age of the 1969-71 catch were approximated using year class intervals constructed on the basis of the 1968 data. Four-year-old fish were most frequently taken in 1968 and 1969, five-year-old fish in 1970, and six-year-old fish in 1971. (Woodard-USGS)
W73-15261

ON THE ORIGIN OF THE WHITING (MERLANGIUS MERLANGUS (L.) IN KIEL BAY, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 02L.
W73-15278

REGULATION OF STOMATAL APERATURE IN ISOLATED EPIDERMAL PEELINGS OF CITRULLUS COLOCYNTHIS (LINN.) SCHRAD, WITH PHENYLMERCURIC ACETATE AND POTASSIUM CHLORIDE,
Jodhpur Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 02I.
W73-15282

LIMNOLOGY OF SOME MADISON LAKES: ANNUAL CYCLES,
State Univ. of New York, Buffalo. Dept. of Biology.
K. M. Stewart, and A. D. Hasler.
Trans Wis Acad Sci Arts Lett. 60 p 87-123, 1972, Illus.
Identifiers: Annual cycles, Climatic variations, Limnology, Lakes, *Wisconsin lakes, *Eutrophication.

Detailed studies of Lakes Mendota, Monona, and Waubesa at Madison, Wisconsin, (USA) provide a comparison of their annual cycles and the influence of climatic variations on their thermal regimes. Lake Waubesa integrates the influence of wind velocity, air, temperature, and solar radiation most rapidly whereas Lake Mendota responds most slowly. Although Lake Monona is still dominated generally by climatic influences, the cultural influences of thermal discharges now causes the ice to depart in spring at a significantly earlier date than the other 2 lakes. The clarity of the Madison lakes generally decreases from Mendota to Monona to Waubesa. Although all 3 lakes are basically eutrophic dimictic lakes with anoxic conditions developing in the lower waters during summer stratification Lake Waubesa may have aperiodic overturns during summer. Comparisons of temperature, O2, Secchi disk, photometer readings, and ice thickness in Lake Mendota show relatively little change from the early studies of Birge and Juday several decades ago.--Copyright 1973, Biological Abstracts, Inc.
W73-15287

OCCURRENCE OF MICROORGANISMS OF DECOMPOSING ORGANIC PHOSPHORUS COMPOUNDS IN 2 TYPES OF BOTTOM SEDIMENTS OF THE EUTROPHIC LAKE JEZIORAK,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
E. Strzelczyk, W. Donderski, and W. Lewosz.
Acta Microbiol Pol Ser B Microbiol Appl. Vol 4, No 3, p 101-110. 1972. illus.
Identifiers: Arthrobacter, Bacillus, *Bottom sediments, Corynebacterium, *Decomposing organic matter, *Eutrophication, Lakes, Microorganisms, Nocardia, Phosphorus, *Poland (Lake Jeziorak), Sediments.

The generic composition of microorganisms (Bacillus, Arthrobacter, Corynebacterium and Nocardia) able to attach phenolphthalein diphosphate, glycerophosphate, lecithin, DNA and RNA was established. Different types of bottom sediments of Lake Jeziorak, Poland, contained different numbers of microorganisms capable of breakdown of these substances. The number of such organisms differed in various sampling periods.--Copyright 1973, Biological Abstracts, Inc.
W73-15293

SOME CLADOCERA AND COPEPODS FROM THE UPPER KLAMATH RIVER BASIN,
Arizona Cooperative Fishery Unit, Tucson.
J. C. Tash.
Northwest Sci. Vol 45, No 4, p 239-243. 1971. Map.
Identifiers: *California, *Cladocera, *Copepoda, *Oregon (Upper Klamath River), River basins.

The occurrence and distribution of some species of Cladocera and Copepoda in the Upper Kalmath River Basin (which overlaps from Oregon into California) were studied. The habitats sampled include springs, reservoirs, lakes, creeks, rivers, canals, sumps, sloughs, and an ox-box. Two-hundred and fifty samples, collected from 25 different areas during 1963-1966, were analyzed for Cladocera and Copepoda. The samples were collected with a variety of different sizes and meshes of plankton nets. Thirty-one species of Cladocera and 28 spp. of Copepoda (10 Calanoida, 5 Harpacticoida) were identified. The occurrence of species in various habitats, the number of species collected in each habitat, and the number of samples taken from each habitat are shown.--Copyright 1973, Biological Abstracts, Inc.
W73-15294

AQUATIC MACROPHYTES AS LIMNOLOGICAL INDICATORS,
National Museum of Wales, Cardiff. Dept. of Botany.
B. Seddon.
Freshwater Biol. Vol 2, No 2, p 107-130. 1972. Illus.
Identifiers: Aquatic flora, Indicators, Limnological studies, *Macrophytes, Species, *Eutrophication, *Trophic categories.

Species of submersed and floating-leaved aquatic macrophytes were placed in a series based on their patterns of occurrence in an ordination of floristic lists. Two chemical parameters from lake water analyses are correlated with the species assemblage in individual lakes and trophic categories are defined on the quatitative chemical characteristics of lake waters. The range and limiting tolerance of

solute content for many aquatic species are described and related to these trophic categories. Restriction towards eutrophic conditions is considered as an obligate relationship reflecting physiological demands. Some dystrophic and oligotrophic species are shown to have wide tolerance and are thought to be excluded from sites of higher trophic status by competition rather than physiological limitation.--Copyright 1973, Biological Abstracts, Inc.
W73-15298

5D. Waste Treatment Processes

DISPOSAL OF SUGAR REFINERY LAGOON EFFLUENTS BY SOIL SPREADING,
North Dakota State Univ., Fargo. Dept. of Bacteriology.
B. R. Funke, and F. W. Schroer.
Available from the National Technical Information Service as PB-223 906, $2.75 in paper copy, $1.45 in microfiche. North Dakota State University Water Resources Research Institute, Fargo, Report WI-221-016-73, May 1973. 7 p, 1 fig, 3 tab, 1 ref. OWRR A-019-N DAK (2).

Descriptors: *Water pollution control, *Industrial wastes, *Waste treatment, *Water reuse, *Sugar crops, Water spreading, Irrigation, Crop response, Methodology, Soil types, North Dakota, Minnesota, Alfalfa, Soybeans, Sudangrass, Waste storage, Lagoons, Recycling.
Identifiers: *Sugar refinery waste treatment, Soil spreading.

Disposal of sugar refining wastes in the Red River Valley of North Dakota and Minnesota represents a considerable problem. The present plants produce wastes with a BOD on the order of 1-2 million people equivalents annually--and more plants are being built. These wastes will have to be disposed of on land. Their disposal in water is now severely curtailed and will be completely banned in the near future. The object of these experiments was to determine the volumes of water which might be disposed of by soil spreading, the effects of these effluents on soil conditions and fertility, and the most feasible cropping to be used on such irrigated lands. Infiltration rates in Fargo clay were low and inadequate for disposing of large volumes of liquid wastes. Columns of soil in metal sleeves were planted with alfalfa, sudan grass, soybeans, and barley crops. Alfalfa, for the period of the first crop, transpired less water than soybeans and sudan grass. But cumulatively over the growing season alfalfa transpired the most water. Soybeans and sudan grass were less efficient in transpiring water. Barley was much less efficient than the other plants tested. No harmful effects on any of the plants were observed from application of the lagoon effluents. The soils showed an increase in salinity from the effluent treatments but was not considered to be serious, at least in the short run. The carbon-nitrogen ratio and pH of the soil were not significantly altered. (Woodard-USGS)
W73-14755

DESIGN AND CONTROL OF TRANSIENT WASTE TREATMENT PROCESSES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
L. E. Erickson.
Available from the National Technical Information Service as PB-223 962, $2.75 in paper copy, $1.45 in microfiche. Kansas Water Resources Research Institute Contribution No. 122, July 1973. 12 p, 5 fig, 2 tab, 6 ref. OWRR A-045-KAN (2). 14-31-0001-3516.

Descriptors: Instrumentation, *Activated sludge, *Waste treatment, Biological treatment, *Waste water treatment, *Measurement, *Control systems.
Identifiers: Process dynamics, Adenosine triphosphate, Population dynamics, Transient response.

The rate at which many wastes are generated varies significantly with time. This research was concerned with the development of measurement procedures to characterize the state of the system, the development of open loop dynamic response information for the activated sludge process, and the synthesis of optimal feedback control systems for waste treatment processes. The use of adenosine triphosphate as a measurable variable to help characterize the state of the process was investigated. This variable responded rapidly to changes in cell physiological state and with the population dynamics of the culture. Important time constants in the activated sludge process have been identified and estimated from the open loop dynamic studies. Optimal feedback control theory has been applied to growth processes and results have been obtained for a completely mixed flow system.
W73-14762

OVERFLOW ARRANGEMENT,
W. J. Hargraves.
U. S. Patent No. 3,749,246, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 912, No 5, p 1808, July 31, 1973.

Descriptors: *Patents, *Aeration, *Waste water treatment, *Sewage treatment, *Aerobic treatment, Pollution abatement, Water pollution control, Water quality control.

This invention relates to multistage aerobic sewage treatment systems and in particular to the construction of the liquid connections between the digestion stages and to the internal configuration of the stages. The system consists of a main digestion chamber with a plurality of secondary digestion chambers. Each chamber is divided into a mixing and aeration portion and a quiet portion by a suitable baffle arrangement. Each chamber has two downward facing concave baffles placed on opposite sides of the chamber. The baffles also cooperate with an upward facing concave wall and with an aerator device to mix the contents of the chamber. The liquid connection between digestion chambers is made so that there will be little or no tendency for solid material to flow from one chamber to another. This is achieved by providing specially-shaped conduit connections between a quiet portion of an upstream stage and an aerating portion of the adjacent downstream stage. The structure which defines a quiet portion should extend above liquid level to prevent floating solids from approaching the connection. Organic waste is delivered to the main chamber through an inlet, causing an increase in liquid level with the result that liquid flows sequentially through the chambers via the connectors. The liquid is thoroughly agitated and aerated in each chamber but the agitated solids do not pass through. (Sinha-OEIS)
W73-14778

FILTER PRESS, MORE PARTICULARLY FOR DEWATERING SLUDGE IN SEWAGE TREATMENT PLANTS,
A. Bahr.
U. S. Patent No. 3,743,100, 3 p, 9 fig, 6 ref; Official Gazette of the the United States Patent Office, Vol 912, No 1, p 153, July 3, 1973.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Sludge treatment, *Filtration, Filters, Equipment, *Pollution abatement, Water pollution control, Water quality control, Dewatering.

A filter press has belts, one at least being a filter belt extending around a drum in a closed loop. A second belt extends around the drum in a double loop the opposite closed ends of which are spaced apart. Dewatering is performed between two filter belts which extend around a drum. The outer belt engages around the inner belt with pressure, so that the filter cake can be subjected to the required pressure. The pressure can be produced either just by the tension of the outer belt or by special load applying pressure rollers. Drum speed is able to lead or lag on the speed of the belts, so that the different speeds help to break up the cohesion of the filter cake between the various inner rollers and outer rollers, greatly improving the dewatering. (Sinha-OEIS)
W73-14779

NEW ADSORPTION PROCESS FOR REMOVING COLOR FROM KRAFT MILL EFFLUENTS,
Rohm and Haas Co., Philadelphia, Pa. Research Div.
D. C. Kennedy.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 4, p 25-29, 1973. 1 fig, 2 tab, 6 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Adsorption, Organic wastes, Costs, Liquid wastes, Chlorides, *Color.

A new one-step, kraft pulp bleach waste treatment process has a cost-performance advantage over existing technology. This new process is based on a polymeric adsorbent. The material has no ionic groups and is not an ion exchange resin, but rather functions as a true adsorbent, removing organics from the waste effluent by Van der Waal's forces. The surface area (150 square meters per gram) and the average pore diameter (250 Angstrom units) have been optimized to give the best compromise between rapid adsorption kinetics and capacity for the organic compounds present in kraft bleach effluents. This results in a very efficient adsorption process. (Knapp-USGS)
W73-14784

A MULTI-POISSON DISTRIBUTION MODEL FOR THE TREATMENT OF DISINFECTION DATA,
National Environmental Research Center, Cincinnati, Ohio.
J. H. Wei, and S. L. Chang.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 39, p 115-120, 1973. 4 fig, 5 ref.

Descriptors: *Disinfection, *Water treatment, *Waste water treatment, Mathematical models, Bacteria, Viruses, *Distribution patterns, Model studies, Poisson ratio.
Identifiers: *Multi-Poisson distribution model.

The multi-Poisson distribution model was based on the concept that death of organisms in a disinfection process is a result of random collision between molecules of a disinfectant and microorganisms; the loss of infectivity of reproducibility of a clump of organisms as a survival unit is due to the cumulative destruction in the clump until the last survivor is rendered nonviable. The mathematics of the multi-Poisson distribution model, its validity in application, and the results obtained in applying it to treat bactericical and virucidal data are described. The applicability of the multi-Poisson distribution model was validated by using it in the analysis of survival curves obtained in the destruction of cysts of a free-living amoeba. (Knapp-USGS)
W73-14788

APPLICATION OF MULTI-POISSON DISTRIBUTION MODEL FOR THE TREATMENT OF VIRUCIDAL AND BACTERICIDAL DATA,
Cincinnati Univ., Ohio.
P. V. Scarpino, S. L. Chang, G. Berg, J. H. Wei, and D. Dahling.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 40, p 121-129, 1973. 7 fig, 3 tab.

Descriptors: *Disinfection, *Water treatment, *Waste water treatment, Mathematical models, Bacteria, Viruses, *Distribution patterns, Model studies, Poisson ratio.
Identifiers: *Multi-Poisson distribution model.

The multi-Poisson distribution model was based on the concept that death of organisms in a disinfection process is a result of random collision between molecules of a disinfectant and microorganisms; the loss of infectivity or reproducibility of a clump of organisms as a survival unit is due to the cumulative destruction in the clump until the last survivor is rendered nonviable. The mathematics of the multi-Poisson distribution model, its validity in application, and the results obtained in applying it to treat bactericidal and virucidal data are described. The applicability of the multi-Poisson distribution model was validated by using it in the analysis of survival curves obtained in the destruction of cysts of a free-living amoeba. (Knapp-USGS)
W73-14789

COMPARATIVE DEATH KINETICS OF INDICATOR MICROORGANISMS UPON HALOGEN DISINFECTION,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
L. N. Kuzminski, and T. H. Feng.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 41, p 130-134, 1973. 3 fig, 14 ref.

Descriptors: *Disinfection, *Bacteria, *Chlorine, *Bromine, Iodine, Pathogenic bacteria, E. coli, Sewage bacteria, *Waste water treatment, *Water treatment.

The relative resistances of several bacterial genera of public health significance to exposure to equivalent doses of chlorine, bromine, and iodine were evaluated. Of the six test microorganisms, Streptococcus faecalis was the most resistant to all halogens. Its resistance was at least three times greater than that of the fecal pollution indicator, Escherichia coli. (Knapp-USGS)
W73-14790

THE CHEMISTRY OF BROMINE CHLORIDE IN WASTE WATER DISINFECTION,
Dow Chemical Co., Midland, Mich. Halogens Research Lab.
J. F. Mills.
In: Preprint of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 43, p 137-143, 1973. 1 fig, 1 tab, 18 ref.

Descriptors: *Disinfection, *Bromine, *Chlorine, Chlorides, Bromides, Chlorination, Bacteria, Viruses, Water treatment, *Waste water treatment, Toxicity, Chemical reactions.

The chemical, biocidal and environmental properties of bromine chloride are generally more complimentary to waste water disinfection than similar properties for chlorine. The high reactivity of bromine chloride contributes to its being an efficient disinfectant of wastes with minimum environmental hazards. The predominant products formed from several competitive reactions of BrCl in waste water are harmless chloride and bromide salts. Using BrCl as the disinfectant, the small amount of bromides added to waste water effluent is well below the national standards of safe levels of bromine. (Knapp-USGS)
W73-14791

THE COMPARATIVE MODE OF ACTION OF CHLORINE, BROMINE, AND IODINE ON F2 BACTERIAL VIRUS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health.
V. P. Olivieri, C. W. Kruse, Y. C. Hsu, A. C. Griffiths, and K. Kasata.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 44, p 144-150, 1973. 5 fig, 15 ref.

Descriptors: *Disinfection, *Viruses, *Bacteria, *Chlorine, *Bromine, *Iodine, Water treatment, *Waste water treatment, Toxicity, Chlorination.

The halogens belong to a class of general protoplasmic poisons and are effective disinfectants for a wide spectrum of microorganisms. Their mode of action on viruses, however, appears to differ. Iodine functions through iodination of the amino acid tyrosine in the protein moiety of the virus with almost no effect on the nucleic acid even at extremely high concentrations. Bromine, although capable of inactivating the nucleic acid does not appear able to penetrate the protein. The primary mechanism is more likely involved with the viral protein. Chlorine readily inactivates the RNA in intact virus in a manner similar to the observed for the whole virus with respect to contact time and pH. (Knapp-USGS)
W73-14792

BROMINE DISINFECTION OF WASTE WATER EFFLUENTS,
Illinois State Water Survey, Urbana.
F. W. Sollo, H. F. Mueller, and T. E. Larson.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 45, p 151-155, 1973. 2 tab, 6 ref.

Descriptors: *Disinfection, *Viruses, *Bacteria, *Chlorine, *Bromine, *Iodine, Water treatment, *Waste water treatment, Toxicity, Chlorination, Effluents.

The efficiency of chlorine and bromine as disinfectants were compared to determine whether or not bromine might have advantages over chlorine. Bromine was somewhat more effective at pH 7.5 than at pH 6.0 and was considerably more effective at pH 9.0. This is a definite reversal of the chlorine pattern. Bromine was three times as effective as chlorine at pH 6.0, eight times as effective at pH 7.5, and 30 times as effective as chlorine at pH 9.0. Prechlorination reduced the required bromine dosage necessary to obtain a particular degree of disinfection. From these few studies, the data would indicate that prechlorination conserves bromine by satisfying the immediate demand of the effluent. (Knapp-USGS)
W73-14793

WASTEWATER DISINFECTION OF TRICKLING FILTER EFFLUENT WITH BROMINE AND CHLORINE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
W. Sun, L. W. Little, and J. D. Johnson.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 46, p 156-159, 1973. 4 fig, 9 ref.

Descriptors: *Disinfection, *Viruses, *Bacteria, *Chlorine, *Bromine, *Iodine, *Trickling filters, Water treatment, *Waste water treatment, Toxicity, Chlorination.

Reduction in demand of tertiary treated sewage allows bromine to become the superior disinfectant at the same weight dosage as chlorine in the pH range 6-10. Since tertiary treatment of sewage for phosphate removal may soon become mandatory, this may make bromine a very attractive alternative to chlorine. Studies were carried out at Mason Farm trickling filter plant (Chapel Hill, N.C.) with tertiary sewage effluent. To decrease phosphate and the halogen demand, the secondary effluent was dosed with 200 mg/liter alum and allowed to settle. This was then disinfected with 2, 5, 10, and 20 mg/liter chlorine and bromine for determination of dosage effect. (Knapp-USGS)
W73-14794

BROMINE, CHLORINE, AND IODINE COMPARED AS DISINFECTANTS FOR AMOEBIC CYSTS,
Johns Hopkins Univ., Baltimore, Md. School of Hygiene and Public Health.
R. P. Stringer, W. N. Cramer, and C. W. Kruse.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 47, p 160-165, 1973. 2 fig, 10 ref.

Descriptors: *Disinfection, *Chlorine, *Bromine, *Iodine, *Microorganisms, *Waste water treatment, Water treatment, Chlorination, Toxicity.
Identifiers: *Amoebic cysts.

Bromine was compared with iodine and chlorine as a disinfectant for amoebic cysts in deionized distilled water and in secondarily treated sewage effluent. Variables included pH and contact time. In distilled water bromine is the superior cysticide throughout the pH range 4 to 10. Halogen species predominating below pH 7 are more cysticidal than those predominating above pH 7. In sewage effluent at pH 6 only iodine has significant value as a cysticide. At pH 8 chlorine, bromine, and iodine are equally poor cysticides. The loss of cysticidal potency of both chlorine and bromine in sewage is attributed to its affinity to combine with interfering substances. Iodine, unlike bromine the chlorine, does not have this affinity and remains free in sewage. Iodine is the best disinfectant for amoebic cysts in heavily contaminated water. The Globaline tablet which releases 8 mg/liter of iodine and releases an acidic buffer to lower water pH to from 6.5 to 7 is the best disinfectant available for emergency supplies of drinking water contaiminated with E. histolytica cysts. (Knapp-USGS)
W73-14795

DISINFECTION OF WATER AND WASTEWATER USING OZONE,
Crane Co., King of Prussia, Pa. Cochrane Div.
E. W. J. Diaper.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 48, p 166-169, 1973. 4 ref.

Descriptors: *Disinfection, *Bacteria, *Viruses, *Ozone, *Waste water treatment, *Water treatment, Toxicity, Costs.

Ozone is an allotropic form of oxygen with powerful oxidizing and sterilizing properties, about twice as potent as chlorine. Ozone is applied to water by means of injectors, diffusing systems or emulsion turbines which force much of the ozone into solu-

tion and into intimate contact with the impurities in the water. Ozone is effective in disinfecting water supplies by the destruction of pathogenic organisms, reducing color by oxidizing or bleaching out dissolved or collidal organic matter and eliminating taste and odor problems. Ozone costs approximately 8 cents per pound produced from air, and 3.5 cents per pound when made from oxygen (plus cost of oxygen). Installation costs range from $500 to $1000 for each pound per day of ozone generating capacity. An outstanding advantage of ozone is its immediate and effective attack on viruses in water supplies. (Knapp-USGS)
W73-14796

ECONOMICAL WASTEWATER DISINFECTION WITH OZONE,
Grace (W.R.) and Co., Baltimore, Md. Davison Chemical Div.
H. M. Rosen, F. E. Lowther, and R. G. Clark.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 49, p 170-176, 1973. 1 fig, 1 tab, 15 ref.

Descriptors: *Disinfection, *Bacteria, *Viruses, *Ozone, *Waste water treatment, Water treatment, Toxicity, Turbidity, E. coli.

Ozone is better virucide than chlorine and a much quicker bacterial disinfectant. A 10 gpm contactor was built and tested on secondary activated sludge effluents. Disinfection occurs within the 30 to 60 second retention time. Turbidity is apparently the limiting factor in efficiency. Disinfection of a municipal secondary oxygen activated sludge effluent was accomplished in 45 seconds, reaching and commonly prescribed average levels of less than 1000 total, less than 250 fecal and less than 10 Escherichia coliform per 100 ml, with a dosage of 4 to 5 mg/liter ozone. In all cases an average 40%-50% reduction of color and turbidity was also observed. (Knapp-USGS)
W73-14797

VIRUS INACTIVATION BY CHLORINE DIOXIDE AND ITS APPLICATION TO STORM WATER OVERFLOW,
Syracuse Univ., N.Y.
J. E. Smith, and J. L. McVey.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 50, p 177-185, 1973. 8 fig, 1 tab, 10 ref.

Descriptors: *Disinfection, Chlorine, Viruses, *Viricides, *Chlorination, Bacteriophage, *Waste water treatment, Storm drains, *Storm water, *Bactericides.
Identifiers: *Chlorine dioxide, Storm overflows.

Chlorine dioxide has greater oxidizing activity than hypochlorite. It is a more efficient bactericide. To determine the viricidal properties of C102, laboratory studies were made of the inactivation of bacteriophage and polivirus. Chlorine dioxide inactivates viruses very rapidly, and it has a wide spectrum of viricidal activity. No truly resistant virus was found and no resistant phage mutants were observed. Chloride demand by heavily contaminated water is slightly less severe for C102 than for Cl. This lengthens the working life of the disinfectant and reduces the dosage needed. (Knapp-USGS)
W73-14798

SOME REACTIONS OF CHLORINE AND OXY--CHLORINE SPECIES WITH ORGANIC COMPOUNDS IN AQUEOUS MEDIA,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
For primary bibliographic entry see Field 05B.
W73-14799

RECYCLE, WHAT DISINFECTANT FOR SAFE WATER THEN,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
M. A. McClanahan.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 54, p 198-208, 1973. 5 fig, 8 ref.

Descriptors: *Disinfection, *Ozone, *Chlorination, *Water reuse, *Reclaimed water, Water treatment, Chlorine, Recycling, *Waste water treatment.

Direct connection to a source of pathogenic organisms, as will occur in recycling of water, necessitates the use of the best disinfection practice available. Chlorination alone will not adequately serve to protect the consumer under the varying quality of effluent from the waste treatment processes that will be used. There are several possiblities that could be used to solve this problem; not the least of them would be improved reliability of the waste treatment process. Another would be the use of a dual disinfectant system. The most promising is ozone-chlorine. With this combination the ozone, which does not have the interferences of dissociation and reaction with ammonia that chlorine does, would provide destruction of the organisms in the raw recycled water. Because of the short life of ozone in water, chlorine would have to be added to maintain the quality of the water throughout the treatment plant and the distribution systems. (Knapp-USGS)
W73-14802

DECHLORINATION BY ACTIVATED CARBON,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. L. Snoeyink, and M. T. Suidan.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 55, p 209-212, 1973. 9 ref.

Descriptors: *Chlorination, *Activated carbon, Water treatment, *Waste water treatment, *Disinfection, Water chemistry, Chemical reactions.
Identifiers: Dechlorination.

Activated carbon may be used to reduce chlorine-containing compounds following superchlorination in treatment of water, or following addition of chlorine for disinfection of effluents from sewage treatment plants. An important feature of the reaction of chloramines with carbon is that N (-III) is converted to nitrogen gas so that this reaction functions to remove ammonia as well. (Knapp-USGS)
W73-14803

DESIGN OF ACTIVATED CARBON ADSORBERS FOR AQUEOUS CHLORINE REMOVAL BASED ON THE MECHANISM OF REMOVAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05F.
W73-14804

EFFECTIVENESS OF CHLORINE IN ELIMINATING BACTERIA AND VIRUSES FROM TERTIARY TREATED WASTEWATER,
Arizona Univ., Tucson. Dept. of Microbiology.
P. P. Ludovici, R. A. Phillips, and W. S. Jeter.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 57, p 218-222, 1973. 2 tab.

Descriptors: *Disinfection, *Tertiary treatment, *Water reuse, *Chlorination, Water treatment, *Waste water treatment, Bacteria, Viruses, Viricides, Water chemistry, Bactericides

Two chlorine treatments were tested for use in eliminating enteroviruses and bacteria from tertiary-treated water. Chlorination was studied in samples which were seeded with known varying concentrations of enteroviruses. Fecal streptococci were the most resistant microorganisms. The two viruses polio 1 and Coxsackie B1 were next in resistance to chlorine inactivation followed by the coliform group of organisms. Coxsackie B2 and echo 13 viruses were most sensitive to chlorine in pilot filter effluent water. However, echo 13 virus showed no increased destruction when the dose of chlorine was raised from 2 to 4 mg per liter. (Knapp-USGS)
W73-14805

DISINFECTION OF WASTEWATER EFFLUENTS FOR VIRUS INACTIVATION,
Maryland Univ., College Park
J. T. Cookson, Jr., and C. M. Robson.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 58, p 223-228, 1973. 4 fig, 1 tab.

Descriptors: *Disinfection, *Tertiary treatment, *Water reuse, *Chlorination, *Ozone, Water treatment, *Waste water treatment, Bacteria, Viruses, *Viricides, Water chemistry, Bactericides.

One of the most important processes for achieving virus removal is disinfection. Proper disinfection can provide an essentially virus free effluent. At present, only a combination of treatment processes designed to meet specific standards and followed by terminal disinfection will produce complete virus removal. The ability of terminal disinfection to produce safe water depends on the previous treatment processes and their performance in removing substances that interfere with virus disinfection. The substances that interfere with virus removal can be monitored by two general parameters: turbidity and biochemical oxygen demand. Viruses become enmeshed in suspended solids that impart turbidity to waters, allowing viruses to escape the disinfection action. It is therefore necessary that turbidity before terminal disinfection be no more than one Jackson unit. High BOD values make disinfection for virus inactivation difficult. (Knapp-USGS)
W73-14806

EVALUATIONS OF STREAM POLLUTION AND TRACE SUBSTANCES IN THE NEW LEAD BELT OF MISSOURI,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05B.
W73-14857

MUSKEGON SPRAYS SEWAGE EFFLUENTS ON LAND,
Environmental Protection Agency, Chicago, Ill. Region V.
E. I. Chaiken, S. Poloncsik, and C. D. Wilson.
Civil Engineering, American Society of Civil Engineers, Vol 43, No 5, p 49-53, 1973. 5 fig.

Descriptors: *Waste water reclamation, *Michigan, *Sewage effluents, *Sprinkler irrigation, *Water reuse, Agriculture, Crops, Tertiary treatment, Recycling, Soil filters, Costs, Chlorination, Social impact, Economic impact, Pervious soils, Acidic soils, Water quality, Monitoring, Waste water treatment, Financing, Use rates, Operating costs, Return (Monetary), Crop production, Waste water disposal.
Identifiers: *Muskegon (Mich.).

To eliminate discharge of polluted wastes into surface waters, Muskegon County, Michigan, is

channeling its wastewater through an irrigation network to provide water and nutrients for crops. Tertiary treatment will be effected by filtration through the soil. Hopefully the surface waters will then meet federal and state water quality standards. The combined raw sewage from all sources in western Muskegon County will be aerated in lagoons and then chlorinated before being sprayed on land. The soil-plant complex will act as a filter to remove the bulk of the nutrients, trap pathogenic bacteria, and remove other contaminants. The filtered water will then be removed by an extensive system of buried drains that will discharge it to the headwaters of streams flowing into shoreline lakes. The soils on the irrigation site, naturally low in plant nutrients and in available water holding capacities, absorb and transmit water rapidly. The local share will be paid from a $16 million bond issue. A portion of the capital costs and all of the operating costs will be recovered by a user charge based on flow. A study will be made of the marketability of effluent-grown crops. (Jones-Wisconsin)
W73-14884

PURIFICATION OF WASTE WATERS BY MEANS OF AERATED LAGOONS (L'EPURATION DES EAUX RESIDUAIRES PAR LAGUNAGE AERE),
J. Bebin.
Papier, Carton et Cellulose, Vol 21, No 4, p 31-41, April 1972. 3 fig, 3 illus, 1 tab, 28 ref.

Descriptors: Lagoons, *Aerated lagoons, *Waste water treatment, Water pollution treatment, *Biological treatment, Water purification, Waste water (Pollution), Water types, Effluents, Anaerobic conditions, Aerobic conditions, Temperature, Oxygen demand, Aeration, Oxygenation, Sludge, Stabilization, Control, Wastes, Erosion control, Pulp and paper industry, Algae, *Marine algae, Sludge disposal, Liquid wastes, *Pulp wastes, Industrial wastes, Treatment facilities, Engineering structures, Europe, Erosion control.
Identifiers: Kraft mills, Clarification, Residence time, Operating variables, *France (Baupte), *Sweden (Frovifors).

The four main types of effluent-treating lagoons, namely, anaerobic, aerobic, aerated, and facultatively aerated, are compared. The theoretical principle and practical operation are discussed of lagoons in commercial use, most of which are only facultatively aerated, since they do not maintain all particles in constantly agitated suspension. Operating variables discussed and pertinent calculations presented include temperature, residence time, oxygen demands, aeration or oxygenation, sludge production, ultimate clarification and stabilization needs of various industrial and domestic wastes, and lagoon design and construction parameters, such as erosion control. Two case histories of industrial lagoon installations are described, one at Etablissements Auby in Baupte, France, where gelling agents, stabilizers, and other chemicals are extracted from marine algae, the other at Orebro Pappersbruks AB. in Frovifors, Sweden, a kraft pulp and paper mill. (Speckhard-IPC)
W73-14916

WHITE WATER REUSE ON A FINE-PAPER MACHINE,
Western Michigan Univ., Kalamazoo. Dept. of Paper Science and Engineering.
L. C. Aldrich, and R. L. Janes.
Tappi, Vol 56, No 3, p 92-96, March 1973. 9 fig, 4 tab, 28 ref.

Descriptors: *Water reuse, *Recycling, *Water conservation, Pulp and paper industry, Discharge (Water), Closed circuits, Biochemical oxygen demand, *Industrial wastes, Waste water (Pollution), Suspended solids, Chemicals, Additives, Bioassay, Microorganisms, Aquatic microorganisms, Slime, Costs, Operating costs, Hardwood, Softwood, Effluents.
Identifiers: Fine papers, Printing papers, Paper properties, Fourdrinier machines, *White water, Paper machines, Sizing degree, Rosin, Fillers, Ash content, Papermaking, Felts (Papermaking), Western Michigan University.

Since increased reuse of paper machine waste water (white water) seems desirable both from economic and ecologic viewpoints, three continuous trial runs of 3 to 5 days' duration were conducted on the 30-inch wide experimental fourdrinier machine at Western Michigan University with 72% vs over 97% reuse of white water, corresponding to discharges of 13,000 vs less than 1300 gal per ton of paper made from a mixture of hardwood and softwood bleached kraft pulps (with 15% filler addition). Increasing the system's closure from 72 to 97% water reuse did not seriously affect the quality of the manufactured paper. After several minor changes in equipment and operating procedure, the paper differed only negligibly in strength properties, dirt content, and printability. Any differences in felt filling, pressing efficiency, and suspended solids were minor, despite increased amounts of dissolved solids in the white water. Although BOD concentrations increased, the total effluent BOD was reduced 50%. At the same time, chemical savings amounted to 18% of filler, 50% of alum, and 20% of rosin without impairment of paper opacity, mineral content, or sizing degree. These savings readily compensated for the cost of machine and operating modifications required. A bioassay of the closed water system during these runs indicated an increase in microorganism growth rate when operating temperature was raised from 90 to 110 F, but a drop in growth upon further temperature elevation to 125 F. (Brown-IPC)
W73-14920

A GENERAL PERSPECTIVE CONCERNING THE COST OF POLLUTION ABATEMENT AT ANY SPECIFIED LEVEL,
Institute of Paper Chemistry, Appleton, Wis.
R. A. Holm.
Tappi, Vol 56, No 3, p 126-130, March 1973. 5 fig, 1 tab.

Descriptors: *Pollution abatement, *Cost-benefit analysis, *Industrial wastes, *Mathematical models, Air pollution, Water pollution control, Treatment facilities, Operating costs, Capital costs, Effluents, Treatment, Water pollution treatment, Waste treatment, *Waste water treatment, Pollutants, Environmental control, Environmental engineering, Equations, Return (Monetary), Cost analysis.

A simplified mathematical model of the overall effect of antipollution treatment on the cost of pollutant capture to a specified level is presented, which is applicable to several conventional methods of air and water pollution abatement. The model uses common power law functions for the interacting and competing factors of economies of scale and diminishing returns. Two variations of the model were developed, viz., one for the relative total cost of state-of-the-art pollutant capture facilities, the other for marginal or additional cost per unit of pollutant removed in the same facilities. The relative cost of capturing or treating a given amount of pollutant is known to rise with the level of treatment. This simplified model gives approximate quantitative answers to the question of how much the cost will increase. The cost functions depend sufficiently strongly on the level of pollutant capture to emphasize the desirability of formulating equally broad fundamental relationships for the environmental quality benefits derivable from such capture or treatment. It is concluded that, over realistic ranges of parameter variation, the principle of diminishing returns dominates the system, and that the cost per unit of pollutant captured climbs strongly at higher specified treatment levels. (Brown-IPC)
W73-14921

REVERSE OSMOSIS CONCENTRATION OF SPENT LIQUOR SOLIDS IN PRESS LIQUORS FROM HIGH-DENSITY PULPS,
Institute of Paper Chemistry, Appleton, Wis.
A. J. Wiley, K. Scharpf, I. Bansal, and D. Arps.
Tappi, Vol 55, No 12, p 1671-1675, Dec 1972. 2 fig, 6 tab, 6 ref.

Descriptors: *Pulp wastes, *Treatment facilities, *Sulfite liquors, *Waste water treatment, *Wisconsin, *Pilot plants, Pulp and paper industry, Industrial wastes, Waste water (Pollution), Osmosis, Membrane processes, Separation techniques, Treatment, Biochemical oxygen demand, Chemical oxygen demand, Color, Suspended solids, Effluents, Liquid wastes, Pollution abatement, Water pollution control, Recycling, Temperature, Chemicals, Operating costs, Capital costs, Costs, Economic feasibility, *Reverse osmosis.
Identifiers: Spent liquors, Sulfite mills, Chemimechanical pulping, Pulp washing, Continuous process, Combined locks, Zenith press, Process water, Presses, Thickeners, Concentrating (Process).

Dilute pulp wash waters from high-yield sodium sulfite chemimechanical pulping have been concentrated tenfold from 0.5-1.0% to 5-10% solids contents by continuous reverse osmosis in a pilot unit. This fifth field demonstration of the IPC pilot unit confirmed pollution reductions of 78-80% in five-day BOD, COD, color, and suspended solids for mill effluents discharged by Appleton Papers Inc. at Combined Locks, Wisconsin. Capital and operating cost estimates for effluent treatment by reverse osmosis in conjunction with a Zenith press appear favorable in terms of water pollution abatement, recovery of reusable process water, and recycling of recovered pulping (cooking) chemicals. Problems of membrane fouling by polysaccharides could be reduced by sustained reverse osmosis at 45C and possibly higher temperatures. (Brown-IPC)
W73-14923

USE OF MIXED MEDIA IN WATER PLANT FILTRATION,
Mead Corp., Kingsport, Tenn.
J. K. Sullins.
Tappi, Vol 56, No 3, p 67-68, March 1973. 2 tab.

Descriptors: *Waste water treatment, *Water treatment, *Filtration, *Industrial water, *Pulp wastes, *Filters, Turbidity, Flocculation, Water purification, Freshwater, Water types, Water quality control, Water storage, Chlorination, Hydrogen ion concentration, Water supply, *Tennessee, *Water conservation.
Identifiers: Aluminum sulfate, Microfloc filters, Paper machines, Bleach plants, Printing papers, Papermaking, Paper mills.

At Kingsport, Tennessee, the Mead Corp. produced bleached wood pulp and coated or uncoated printing papers. Because the water quality requirements of the paper machines equal those of the pulp bleaching plant, a single water quality for the entire mill is supplied by prechlorination, pH control, and alum flocculation. Installation of the No. 5 paper machine required additional filtered water and new clear well capacity. Instead of installing new filters and added storage capacity, mixed-media filter beds (supplied by Neptune Micro Floc Inc.) were installed in two of the existing six filters, operating in parallel on clear well level. Although designed for a filtration rate of 5 gal/min/sq ft, the turbidity specifications were attained even at rates above 10 gal/min/sq ft. While these two filters deliver 75% of the mill's total filtered water supply, the entire operation of the water treatment plant has been simplified. (Brown-IPC)
W73-14924

CONTROL OF SULPHITE PULPING WASTES IN THE UNITED STATES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
H. W. Gehm.
Pure and Applied Chemistry, Vol 29, p 281-290, 1972. 1 fig, 3 tab, 22 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste water treatment, *United States, Treatment facilities, Pollution control treatment, Pulp and paper industry, Biological treatment, Effluents, Activated sludge, Aerated lagoons, Waste treatment, Biochemical oxygen demand, Incineration, Byproducts, Organic compounds.
Identifiers: Sulfite mills, Spent sulfite liquors, Spent NSSC liquors, Neutral sulfite pulping, Kraft mills, Chemical recovery, Clarifiers, Fluidized beds, Acetic acid, Formic acid, Organic acids, Carboxylic acids, Soluble-base pulping liquors.

The U.S. sulfite pulp industry currently produces about 10,000 short tons daily of acid sulfite pulp and an equal amount of neutral sulfite pulp may double. Most of the spent sulfite liquors are incinerated, largely in fluidized-bed furnaces, with or without subsequent recovery of chemicals. Acid-process mills use magnesium or ammonia bases to equal extents; only one mill uses a sodium-base liquor. The fluid-bed furnace is being adapted to Mg base liquor combustion with chemical recovery. Effluents from acid sulfite mills practicing chemical recovery still contain about 20% of the original BOD load. Reductions averaging above 85% in BOD have been achieved by full-scale biological treatments of magnesium- or ammonia-base liquors in aerated basins or by the activated sludge process. Only about 10% of acid spent liquor is being converted to marketable byproducts, and the number of companies doing this is decreasing. Neutral sulfite effluents are being treated by various means. Chemical recovery plants employ either the Institute of Paper Chemistry or the Mead process. Whenever neutral sulfite mills are affiliated with kraft pulp mills, their spent pulping liquors are generally diverted to the kraft recovery system as makeup chemicals, the remaining effluents being treated by clarification and bio-oxidation. Three mills use ultimate land disposal, three others discharge their effluents to the treatment systems of large municipalities. One mill recovers formic and acetic acids, and sells the remaining raffinate to a kraft mill. (Witt-IPC)
W73-14929

GREAT LAKES PAPER EXTERNAL FEEDWATER SYSTEM FOR HIGH-PRESSURE BOILERS,
Great Lakes Paper Co. Ltd., Thunder Bay (Ontario).
For primary bibliographic entry see Field 05F.
W73-14930

THE 'SAVO' METHOD TREATS INDUSTRIAL PROCESS WATER.

Pulp and Paper International, Vol 14, No 9, p 35-37, Aug. 1972. 3 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Industrial wastes, *Pollution control treatment, *Pulp wastes, Suspended solids, Dissolved solids, Biochemical oxygen demand, Flocculation, Flotation, Separation, Sewage treatment, Europe, Foreign research, Combined treatment, Water conservation, Industrial water, Pulp and paper industry, Pilot plants, Effluents, Closed conduits.
Identifiers: Finland, *Savo process.

An effluent purification process which functions like an artificial kidney has been developed by Savo Oy., Finland, in cooperation with Fintraco Oy. and the Finnish Pulp and Paper Research Institute. Suspended solids and part of the dissolved solids are flocculated chemically, then separated by flotation. Pilot-plant studies indicate that over 90% of suspended solids and about 25% of dissolved matter can be removed, along with 30% BOD reductions. Advantages of the process are major savings in freshwater intake, the possibility of closing secondary water circuits, and the feasibility of treating the resulting clarified water biologically together with municipal sewage. Initially designed for treating effluents from a hardboard factory, the process was found adaptable to all kinds of pulp and paper industry waste waters, including sooty water from flue gas scrubbers. A full-scale industrial installation is under construction in the USA, and a process water treatment plant is already operating in Sweden. (Witt-IPC)
W73-14933

PURIFICATION OF EFFLUENTS FROM THE PRODUCTION OF BLEACHED SULFITE PULP BY THE ACTIVATED SLUDGE METHOD (OCZYSZCZANIE METODA OSADU CZYNNEGO SCIEKOW Z PRODUKCIJI MASY CELULOZOWEJ SIARCZYNOWEJ BIELONEJ),
Instytut Celulozowo-Papierniczy, Lodz (Poland).
Z. Skwara, K. Lelonkiewicz, and C. Leszczynski.
Przeglad Papierniczy, Vol 28, No 10, p 358-362, Oct. 1972. 1 tab, 2 fig, 17 ref. (English summary).

Descriptors: Water pollution treatment, *Waste water treatment, *Activated sludge, *Bleaching wastes, *Pulp wastes, *Sulfite liquors, Biological treatment, Effluents, Pulp and paper industry, Industrial wastes, Sedimentation, Biochemical oxygen demand, Nutrients, Foaming, Additives, Treatment facilities, Laboratory equipment, Aeration, Chlorine, Recycling, Hydrogen ion concentration, Neutralization, Foreign research, Color.
Identifiers: *Sulfite mills, Spent sulfite liquor, Bleach plants, Poland, Foam inhibitors.

Sulfite pulp mill effluents were treated for 5.0-5.5 hr with activated sludge in two laboratory aeration chambers, using different amounts of added N and P nutrients to give 5-day BOD:N:P ratios of 100:5:1 and 100:2.5:0.5, respectively. Chamber effluents were allowed to settle 1.7 hr in secondary sedimentation vats, from which the activated sludge was recycled to the aeration chambers. A 3:97 (v/v) mixture of Ca-base spent sulfite liquor and bleach plant effluent having an average 5-day BOD of 480 mg oxygen/liter (of which circa 40 mg was contributed by the bleach effluent) was treated with nutrients and neutralized to pH 7.5 with KOH, while foaming was controlled by adding 5-10 mg/liter of 'Spumol C'. Ready biodegradation occurred with both nutrient ratios, viz., BOD reductions of 92% for the 100:5:1 ratio and 91% for the 100:2.5:0.5 ratios. Amounts of excess activated sludge were significantly less with smaller nutrient additions. The foam inhibitor did not interfere with the biodegradation. Neither did the presence of ca. 3 mg/liter of active chlorine. The color intensity of the treated effluent increased by 20%. Best results, in terms of cost and treatment efficiency, were noted at activated sludge loads of 0.6 g BOD/g/day and aeration chamber loads of 2 kg BOD/cu m/day. (Stapinski-IPC)
W73-14934

WASTE WATER CLARIFICATION IN THE PAPER INDUSTRY THROUGH MODERN RETENTION AIDS (ABWASSERKLAERUNG IN DER PAPIERINDUSTRIE DURCH MODERNE RETENTIONSMITTEL),
Farbenfabriken Bayer A.G., Leverkusen (West Germany).
H. Tretter.
Der Papiermacher, Vol 21, No 6, p 91-95, Oct. 6, 1972. 10 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Additives, *Retention, Polymers, Cations, Zeta potential, Hydrogen bonding, Pulp and paper industry, Hydrogen ion concentration, Turbidity, Industrial wastes, Liquid wastes, Effluents, Drainage effects, Drainage, Dewatering, Flotation, Monitoring, Control systems, Instrumentation, Polyelectrolytes.
Identifiers: *Chemical recovery, Retaminol, Germany, Fourdrinier machines, Paper machines, Papermaking, White water.

A paper machine consumes 10 to 1000 liters water per kg of paper manufactured. Recovery of fibers, fillers, pigments, and other papermaking additives from the machine waste water (white water) is essential both for economic and environmental reasons. Cationic polymers, such as those marketed under the trade name 'Retaminol', act as solids-retention aids by virtue of their zeta-potential which reduces the negative potential of pulp fibers, as well as through a hydrogen-bonding mechanism. Retention aids must not be so cationactive as to interfere with the action of optical brighteners (fluorescent dyes). Most retention aids also improve the drainage of water from the pulp stock on the fourdrinier wire. Some also function as flotation aids. Their effectiveness depends on careful pH control, as well as on proper dosage. Best economic efficiency is achieved with additions of 0.05 to 0.1%, based on fiber weight, or 0.2-0.4% when accelerated dewatering is also desired. Retention aids should be added before the fiber suspension reaches the stock inlet or headbox, e.g., in the stock chest or mixing vat. Dose rates can and should be monitored by measurements of the white water turbidity. (Speckhard-IPC)
W73-14935

PROGRAM ATTACKS LAND, WATER, AIR POLLUTION.

Paper Age, Vol 8, No 10, p 1, 14, 17, Oct. 1972. 1 illus.

Descriptors: *Pulp wastes, *Water pollution control, Treatment facilities, *Incineration, Heated water, Industrial wastes, Pulp and paper industry, Air pollution, Water pollution, Bark, Solid wastes, Burning, Disposal, Sludge disposal, Sludge, *Canada, Temperature, Steam, Boilers, *Waste water treatment, Pollutants, Liquid wastes, *Waste treatment.
Identifiers: *Thunder Bay (Ontario), Copeland process, Clarifiers, Deicing, Pulpwood, Steam consumption, Energy consumption, Reactors, Blowers, Screw conveyors, Conveyors, Gas scrubbers, Scrubbers, Fluidized beds, Furnaces.

At Thunder Bay, Ontario, the Great Lakes Paper Co. utilizes the Copeland fluidized-bed process to burn and dispose of solid wastes and liquid effluents, such as bark, groundwood snipes, and clarifier sludge, while simultaneously generating hot water for deicing of pulpwood logs in the woodroom. This permits steam consumption to be reduced by 20,000-30,000 lb/hr. The core of the patented Copeland process is the fluid-bed reactor which operates at 1500F and is capable of incinerating dilute wastes containing as little as 30% solids without creating air pollution problems. Air blowers, air preheaters, screw conveyor discharge lines, and gas scrubbers complement the central equipment. (Witt-IPC)
W73-14936

TREATMENT OF SULFITE PULP AND PAPER MILL WASTE,
Procter and Gamble Co., Cincinnati, Ohio.
C. A. Barton, J. F. Byrd, W. A. Eberhardt, and G. C. Hullar.
Journal Water Pollution Control Federation, Vol 45, No 1, p 25-43, Jan. 1973. 21 fig, 6 tab, 5 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, Treatment facilities, *Water pollution treatment, *Waste water treatment, Water quality control, Pulp and paper industry, *Pennsylvania, Activated

sludge, Biological treatment, Incineration, Flotation, Evaporation, Aeration, Suspended solids, Filtration, Discharge (Water), Monitoring, Toxicity, Waste water (Pollution), Industrial wastes, Liquid wastes, Temperature, Hydrogen ion concentration, Aquatic life, Dissolved oxygen, Rivers.
Identifiers: Savealls, White water, Sulfite mills, Spent sulfite liquor, *Susquehanna River (Penn).

The waste disposal system installed by Charmin Paper Products Co. at its sulfite pulp and paper mill in Mehoopany, Pennsylvania, was designed to protect the water quality of the Susquehanna River. It comprises the following main features: In the pulp mill, strong (concentrated) liquid wastes undergo evaporation and combustion, while dilute wastes are aerated and flotated for suspended solids removal prior to activated sludge treatment. In the paper mill, continuous flows of excess white water are treated in savealls and recirculated. Spills are screened for removal of solids before being discharged. Problems with pH control, thermal effects, excessive spent sulfite liquor concentrations, and sluge bulking have been overcome. Conscientious water monitoring, including bioassays, indicated that high BOD removals have been attained without excessive effect on river dissolved oxygen and without noticeable harmful effects of discharged treated wastes on aquatic organisms. (Witt-IPC)
W73-14938

A STUDY OF RENOVATION OF PULP MILL WASTE WATER: ADSORPTION CHARACTERISTICS OF KRAFT PULP LIGNIN ON ACTIVATED CARBON, (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
H. Kabeya, T. Fujii, T. Kubo, Y. Kimura, and K. Urano.
Japan Tappi, Vol 26, No 3, p 125-130, March 1972. 6 fig, 1 tab, 6 ref. (English summary).

Descriptors: Water pollution treatment, *Waste water treatment, *Pulp wastes, *Lignins, *Activated carbon, *Adsorption, Industrial wastes, Pollutants, Pulp and paper industry, Foreign research, Kinetics, Hydrogen ion concentration, Temperature, Effluents, Aqueous solutions, Liquid wastes.
Identifiers: Kraft pulping, Alkali lignin, Japan.

The adsorption of kraft lignin (alkali lignin) from aqueous solutions (such as pulp mill effluents) by activated carbon was investigated and found to proceed very slowly. The adsorption capacity of the carbon preparation used was about 2 to 7% by weight for lignin concentrations from 1 to 40 ppm. It increased linearly with increasing pH from 7 to 11. The adsorbed lignin was not desorbed in distilled water. At temperatures between 10 and 40C, the time needed to adsorb a given amount of alkali lignin was halved by a 15-degree rise in temperature. (Brown-IPC)
W73-14941

BALANCE AND CHARACTERISTICS OF EFFLUENTS FROM RECYCLING OF RESIDUAL FERMENTATION LIQUOR (BALANS I KHARAKTERISTIKA STOCHNYKH VOD PRI VOZVRATE POSLEDROZHZHEVOI BRAZHKI NA GIDROLIZ),
L. N. Kraev, S. V. Belyaev, L. I. Bryzgalov, G. I. Kisel'nikov, and N. N. Panov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, Vol 25, No 4, p 11-13, 1972. 1 fig, 3 tab, 5 ref.

Descriptors: *Effluents, *Industrial wastes, Waste water (Pollution), *Fermentation, Hydrolysis, *Water pollution sources, Biochemical oxygen demand, Pollution abatement, *Recycling, *Water reuse, Water conservation, Yeasts, Carbohydrates, Freshwater, Industrial water, Wood wastes, Organic compounds, Organic loading, Incineration, Spillways, Liquid wastes.
Identifiers: Fusel oil, *Hydrolysis industry, USSR, Wood, Tulun Hydrolysis Factory (USSR), Reducing sugars, Reducing compounds, Furfural.

Residual fermentation liquor from the production of yeast is the main contributor to the pollution load of effluents from hydrolysis factories (wood saccharification plants), since it is reponsible for about 70% of the effluent's 5-day BOD. Pollution can be reduced by recycling of the residual liquor as partial replacement for hydrolysis process water. At the Tulun Hydrolysis Factory (USSR), the residual fermentation liquor constitutes 25% of the total effluent volume to be purified. Recycling reduces this volume to 18-21.8% and lowers its contribution to effluent BOD to 61.3-65%. With 25-40.5% recycled residual liquor, overall effluent BOD can be decreased to 12.5-15.3%. Thus, the 5-day BOD of residual liquor from hydrolysis with 100% freshwater was 85 kg per ton of oven-day wood. This could be reduced to 72 kg by 25% recycling, and to 65 kg by 40.5% recycling. Further measures for effluent BOD reductions include: milder intitial percolation hydrolysis conditions; decreases in losses of reducing substances during neutralization and sedimentation; combustion of fusel oil fractions; reuse of steam condensates and of residues from furfural distillation; and avoidance of liquor spills by installing automatic level indicators. (Stapinski-IPC)
W73-14942

RECYCLED WATER POSES DISINFECTANT PROBLEM.

Chemical and Engineering News, p 45-46. Sept. 3, 1973.

Descriptors: *Recycling, *Disinfection, *Potable water, *Water reuse, *Public health, *Waste water treatment, *Water purification, Toxin, Toxicity, Water types, Water treatment, Viruses, Bacteria, Microorganisms, Chlorine, Distillation, Ozone, Storage, Water storage, Aquatic life, Aquatic microorganisms, Coliforms, Chemicals, Organic compounds, Chlorination, Ohio River, Chemical reactions, Hazards.
Identifiers: Rhine River, Germany, Chlorine compounds.

According to M. A. McClanahan of Georgia Institute of Technology, recycled waters pose distinct health hazards as potable waters unless they are adequately disinfected. Some hazards involve viruses and the inadequacy of Escherichia coli counts as safety indicators. Other hazards involve organic residues that may react with disinfectants, such as chlorine, to form toxic, carcinogenic, mutagenic, or teratogenic compounds. Some chlorinated organics may be as persistent as halogenated pesticides. Distillation is the only treatment that can claim complete removal of all organic and biochemical residues. Ozonization is regarded as the most promising alternative, especially in conjunction with chlorination, but ozone is thermolabile and short-lived in water. Before water recycling becomes the prevalent practice, population health studies should be conducted along heavily polluted (sewage-rich) rivers, such as the Ohio and Rhine Rivers, in comparison with regions having relatively pure drinking water. In addition, all recycle systems should provide adequate storage facilities to be used when either the sewage treatment plant or the water disinfection plant breaks down. (Brown-IPC)
W73-14943

WASTEWATER BIOTREATMENT: WHAT IT CAN AND CANNOT DO,
Badger Co., Inc., Cambridge, Mass.
C. W. Moores.
Chemical Engineering, Vol 79, No 29, p 63-66, Dec. 25, 1972. 4 fig, 1 illus.

Descriptors: *Waste water treatment, *Biological treatment, Effluents, *Biochemical oxygen demand, Microorganisms, Dissolved oxygen, Nutrients, Growth stages, Oxidation, Recycling, Aeration, Suspended solids, Sedimentation, Growth rates, Chemical reactions, Kinetics, Treatment, Treatment facilities, Water pollution treatment.

The operating principles, parameters, capabilities, and limitations of biological waste water treatments are discussed. The main objective of 'bioconversion' is the transformation of soluble BOD components into insoluble carbonaceous solids by microorganisms. The converted solids (suspended organisms) must then be removed and disposed of by physical or physico-chemical unit operations. Bioconversion is not 100% efficient. Apart from microorganisms capable of metabolizing the waste, it requires a degradable nontoxic substrate, a source of dissolved oxygen, and trace biological nutrients. The bio-oxidation reaction shows a growth vs. time curve in which three distinct phases can be distinguished, namely, those of logarithmic, declining, and endogenous growth. Continuous bioconversion requires recycling of microorganisms. Its efficiency depends on the F/M (food-to-mass) ratio. Three aeration schemes are feasible, viz., high-rate, conventional, and extended aeration. High-rate systems yield large amounts of biosolids in relatively short aeration periods, but also high concentrations of BOD material in the effluent. Conventional systems produce lower BOD and suspended solids (usually less than 20 mg/liter) in the effluent, but require prolonged aeration. Extended aeration can yield very low BOD concentrations, but produces more suspended solids, ordinarily below 70 mg/liter. Settling of solids is best at F/M ratios of 0.2-0.5 BOD material/day/lb of MLSS (mixed-liquor suspended solids). (Witt-IPC)
W73-14944

RAPID METHOD FOR DETERMINATION OF THE ACTIVITY AND CONCENTRATION OF ACTIVATED SLUDGE (EKSPRESS-METOD OPREDELENIYA AKTIVNOSTI ILA I EGO KONTSENTRATSII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhoi Promyshlennosti, Leningrad (USSR).
M. A. Evilevich, L. K. Korovin, and I. Ya. Stanyukovich.
Bumazhnaya Promyshlennost, No 11, p 16-17, Nov. 1972. 1 fig, 3 ref.

Descriptors: *Activated sludge, *Analytical techniques, *Bioassay, *Biological treatment, Waste treatment, Equations, *Waste water treatment, Effluents, *Pulp wastes, Industrial wastes, Oxygen, Oxygen demand, Biochemical oxygen demand, Microorganisms, Biodegradation, Biomass, Manometers, Laboratory equipment, Control, Carbohydrates, Instrumentation, Measurement, Mixing.
Identifiers: Kraft mills, Recording instruments.

The method described is based on an equation expressing the rate of substrate utilization in continuous microorganism cultures plus the relationship between the rate of substrate utilization and the oxygen uptake under conditions of unlimited oxygen and substrate supplies. The two mathematical expressions combined give the equation, dC/dt ± gamma times X, where dC/dt is the manometrically determined oxygen uptake rate, X is the concentration of cells, and gamma is the system's activity coefficient. The latter is obtained as maximum substrate utilization rate multiplied by the constant of oxygen utilization efficiency in the given biological system. Hence by determining gamma experimentally and by measuring dC/dt, changes in the biomass of activated sludge can be controlled continuously. For a given substrate, gamma characterizes the overall activity of the microflora. A special cell for gamma determinations was constructed, in which activated sludge is saturated with oxygen, and the oxygen concentra-

tion is continuously recorded during intense mixing of sludge with the substrate. In addition to activated sludges suited for treatment of kraft pulp mill effluents, several model substrate compounds (glucose and sodium acetate) were evaluated in the cell-type apparatus. For a given activated sludge, the gamma value was found to depend on the nature of the substrate. For a given substrate, this value depended on the quality of the activated sludge, but was independent of the stage at which the sample was taken. (Stapinski-IPC)
W73-14945

ACTIVATED SLUDGE PROCESS IN SULPHATE PULP WASTE LIQUOR, (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
I. Akamatsu, and H. Kamishima.
Japan Tappi, Vol 25, No 11, p 569-574, Nov. 1971. 5 fig, 3 tab, 6 ref. (English summary).

Descriptors: *Activated sludge, *Pulp wastes, *Bleaching wastes, *Biological treatment, *Waste water treatment, Water pollution treatment, Biochemical oxygen demand, Chemical oxygen demand, Effluents, Pulp and paper industry, Color, Pilot plants, Foreign research, Suspended solids.
Identifiers: Japan.

The treatment of alkaline extraction effluents from a kraft pulp bleach plant in a laboratory activated sluge pilot plant reduced the BOD load (up to 0.8 kg/kg of mixed liquor suspended solids/day) by about 90%. The COD removal was only about 30%, and the effluent color was not significantly reduced. (See also W73-14947) (Brown-IPC)
W73-14946

ACTIVATED SLUDGE PROCESS IN SULPHATE PULP WASTE LIQUOR. PART II. CONTACT-STABILIZATION PROCESS AND PILOT-PLANT EXPERIMENTS,
Government Industrial Research Inst., Takamatsu (Japan).
I. Akamatsu, and H. Kamishima.
Trans. available from Institute of Paper Chemistry, Appleton, Wisconsin 54911. Price: $5.00 . Typescript translation of Japan Tappi, Vol 26, No 5, p 224-231, May 1972. 4 tab, 5 fig, 1 illus, 4 ref.

Descriptors: *Activated sludge, *Biological treatment, *Waste water treatment, Water pollution treatment, *Pulp wastes, *Bleaching wastes, Pulp and paper industry, Suspended solids, Biochemical oxygen demand, Foreign research, Pilot plants, Treatment facilities, Laboratory equipment, Nutrients, Nitrogen compounds, Phosphorus compounds, Effluents, Sedimentation, Sludge, Sludge treatment.
Identifiers: Contact stabilization treatment, Japan.

A pilot plant of 500 liter/hr capacity was used to compare the relative merits of the contact-stabilization vs the conventional activated sludge process for treatment of kraft pulp alkaline extraction (bleaching) effluents containing 2000-3400 ppm of suspended solids. Nutrient additions were varied to give BOD:N:P ratios between 200:5:1 and 300:5:1. A nutrient deficiency, i.e., reduced N and P dosage, decreased the BOD removal to 85-72%. At BOD sludge loadings below 0.5 kg/kg of mixed liquor suspended solids/day, over 90% BOD removals were achieved in both processes. However, at higher BOD loads (ca. 0.8), the conventional process attained only 86% removal compared to 90% for the contact-stabilization process. Sludge sedimentation rates were satisfactory in both processes. (See also W73-14946) (Brown-IPC)
W73-14947

REMOVAL OF DYES FROM WASTE WATERS (UDALENIE KRASITELEI IZ STOCHNYKH VOD),
Tsentralnyi Nauchno-Issledovatelskii Institut Bumagi, Moscow (USSR).
G. I. Leshchinskaite, V. L. Polovinkin, and V. V. Lapin.
Bumazhnaya Promyshlennost No 11, p 9-10, Nov. 1972. 1 tab.

Descriptors: Dyes, *Dye concentrations, *Water pollution sources, *Pulp wastes, *Industrial wastes, *Waste water treatment, *Toxicity, Water pollution treatment, Pulp and paper industry, Effluents, Coagulation, Adsorption, Chemicals, Additives, Clays, Polymers, Organic compounds, Polyelectrolytes, Electrolytes, Color, Retention.
Identifiers: Basic dyes, Acid dyes, Direct dyes, Aluminum sulfate, Ferric chloride, Bentonite, Fixatives, Retention aids, Coagulants, Polyethylenimine, Colored papers, White water.

More than forty different dyestuffs are in commercial use for manufacture of colored papers. Most of these are direct and basic dyes. Acid dyes are used less frequently. Dye concentrations in paper mill waste waters (white waters) vary, depending on the composition of the pulp stock and on other factors, but all of them cause water color and are toxic to aquatic life. Several methods for increasing the dye retention by papermaking fibers and/or for eliminating dye residues from paper machine effluents are available. They include coagulation of direct dyes with aluminum sulfate, ferric chloride, and other chemicals; adsorption of basic dyes on bentonites or other clays; and addition of fixatives to the pulp. Cationic retention aids or fixatives, such as polyethylenimine, work well with acid dyes; dicyandiamide-formaldehyde condensates, such as 'DTsM', are preferred for direct dyes. (Stapinski-IPC)
W73-14948

TREATMENT OF SODA RECOVERY BOILER FEEDWATER WITH TRILON (TRILONNAYA OBRABOTKA KOTLOVOI VODY SODREGENERATSIONNYKH AGREGATOV),
Orgbumdrev, Leningrad (USSR).
B. S. Smirnov, A. S. Rechkina, L. S. Shvaleva, and E. A. Popova.
Bumazhnaya Promyshlennost, No 9, p 20-21, Sept. 1972. 1 fig, 1 tab.

Descriptors: *Boiler feed water, *Additives, *Waste water treatment, *Pulp wastes, *Scaling, Chemical analysis, Alkalis (Bases), Hardness (Water), Iron, Metals, Phosphates, Chelation, Corrosion, Demineralization, Boilers, Industrial water, Water types, Dissolved oxygen.
Identifiers: Recovery furnaces, *Trilon B, Ethylenediamine tetraacetic acid, *USSR (Mariisk).

The feedwater charged into the soda recovery boiler at the Mariisk pulp and paper mill contains 0.3-0.5 meq of alkali, 5-10 meq of hardness components, 70-150 mg of minerals, 80-200 micrograms iron, and 20-30 micrograms oxygen per liter. Phosphates added until 1970 did not substantially control scale deposits. Trilon B gave much better control. Best results were since achieved by adding 3-4 g of EDTA (ethylenediamine tetraacetic acid) per ton of water. Iron removals achieved in consecutive months during two years of EDTA dosage are tabulated. (Stapinski-IPC)
W73-14949

OJI (PAPER CO.), KASUGAI MILL POSITIVELY GRAPPLING WITH ENVIRONMENTAL PROBLEM,
Oji Paper Co. Ltd., Kasugai (Japan).
M. Ishii.
Japan Pulp and Paper, Vol 10, No 1, p 37-43, April 1972. 1 tab, 3 fig, 8 illus.

Descriptors: *Treatment facilities, *Pulp wastes, Pulp and paper industry, *Pollution abatement, Water pollution treatment, Air pollution, *Waste water treatment, Sludge treatment, Incineration, Sludge disposal, Waste disposal, Odor, Sulfur compounds, Industrial wastes, Water reuse, Flocculation, Sedimentation, Aeration, Filtration, Sludge treatment.
Identifiers: *Japan, Kraft mills, Noise control, White water, Clarifiers, Savealls, Lime kilns.

The antipollution facilities at Oji Paper Co.'s kraft pulp and paper mill include the following main features: Colored waste water is treated by a patented process which involves passage through a ferrous chloride (500 g/liter) solution (wastes from a metal pickling factory) to remove 90% of the color and 60-70% of the COD. Odiferous waste water from evaporator condensates is acidified with sulfuric acid or chlorine water (bleaching waste) and oxidized in three blower-equipped aeration tanks to convert hydrogen sulfide into sulfur, methyl mercaptan into sulfonic acid, and sodium sulfide into thiosulfate plus sulfate, thus removing over 95% of odor-causing volatiles. Paper machine waste water (white water) is filtered or passed through savealls for recovery of suspended fibers, clay filler, and other solids, and then sedimented in a 24-m diameter clarifier. The supernatant is recycled as condenser cooling water. The collected total mill effluent is flocculated and precipitated with alum, lime, and a proprietary polymeric flucculant in two clarifiers which yield a treated effluent containing less than 90 ppm COD, 70 ppm BOD, and 50 ppm suspended solids. The sludge produced (30-40 oven-dry tons per day) is concentrated in centrifugal separators and sunlight-drying reservoirs prior to combustion in a rotary lime kiln. A polymeric additive aids the dewatering of chemically precipitated sludge having poor filterability. In addition to these water-related antipollution measures, the mill also provides for air and noise pollution abatement, as well as for general environmental protection through a monitoring program and an educational campaign. Installation and operating costs of all antipollution facilities are listed. They total 1.6 billion yen for capital and 39.4 million yen for operation. (Witt-IPC)
W73-14958

KAMLOOPS POLLUTION CURBS ARE B.C.'S MOST EXTENSIVE.

Canadian Pulp and Paper Industry, Vol 25, No 7, p 21-25, July 1972. 1 fig, 7 illus.

Descriptors: *Pulp wastes, *Pollution abatement, *Treatment facilities, *Bleaching wastes, *Waste water treatments, Water pollution, Air pollution, Sulfur compounds, Boilers, Incineration, Sludge, Wood wastes, Fly ash, Monitoring, Equipment, Recycling, Color, Effluents, Pulp and paper industry, Lagoons, Bodies of water, Sedimentation, Rivers, Lakes, Water pollution treatment, Water pollution control, Aerated lagoons, Biological treatment, Industrial wastes, *Canada, Boilers, Water conservation, Liquid wastes, Ponding, Pondage.
Identifiers: Kamloops, British Columbia, Digesters, Lime kilns, Sulfur dioxide, Exhaust gas, Scrubbers, Clarifiers, Kraft mills, Electrostatic precipitators, Process water, Turpentine, Recovery furnaces, Bleach plants, Paper machines, Dryer sections, Diffusers.

Water and air pollution abatement facilities at the recently built 1250-ton-per-day bleached kraft pulp mill of Weyerhaeuser Canada Ltd. (Kamloops, Brit. Columbia) are described. They include the following major features: A digester blow gas collector; a lime kiln capable of burning odiferous sulfur compounds; two wet scrubbers for sulfur dioxide absorption from kiln flue gas; multi-fuel power boilers capable of incinerating clarifier sludge along with wood waste; an electrostatic precipitator for fly ash removal; high furnace stacks carry-

ng steam plumes above the weather-inversion level of the valley's atmosphere; numerous air monitoring stations; a closed water system for recovery and recycling of suspended fibers and chemicals; a steam stripper and related turpentine recovery unit for keeping turpentine out of the process water and the sewered effluent; the world's largest chemical recovery boiler; a five-stage bleaching plant capable of reducing the color of effluent water; a heat and water recovery system for the dryer section of the paper machine, permitting reduced fresh water intake from the river; an 80-acre 5-day retention lagoon for biological effluent treatment; two sedimentation ponds; a clarifier; a large emergency dump pond; two diffusers for rapid effluent mixing (200:1 dilution factor) and fish protection; and a long-term river and lake survey and monitoring program. (Witt-IPC)
W73-14959

HEALTH CONSIDERATIONS IN RENOVATING WASTE WATER FOR DOMESTIC USE,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
H. I. Shuval, and N. Gruener.
Environmental Science and Technology, Vol 7, No 7, p 600-604, July, 1973. 3 photos, 5 ref.

Descriptors: *Water reuse, *Waste water treatment, Water pollution, Water quality, Toxins, DDT, Aldrin, Chlorine, Ozone, Viricides, *Water quality standards, Toxicity, Pesticides, Public health, Enteric bacteria.
Identifiers: Chlorinitrobenzene, Orthochlorinitrobenzene, Tetralin, *Enteric virus, New Orleans, Bladder cancer, Acceptable daily intake, *Israel (Tel-Aviv), *Denver (Colo).

The possibility of waste water reuse for domestic use is being considered in some water-short areas including Denver, Colo. and Tel-Aviv, Israel. Reclaimed wastewater for human consumption may contain inorganic and organic microchemical pollutants not found in water drawn from less contaminated sources. Conventional wastewater treatment leaves many of these potentially hazardous substances unchanged. Typical drinking water standards are based on an assumption that water is drawn from groundwater or uncontaminated surface water sources; consequently, the few chemical parameters of water standards (20 for the U.S. Public Health Service, only nine of which serve as absolute grounds for rejecting a supply) do not consider many rare and little-known synthetic organic compounds and potential inorganic toxicants which could be present in wastewater. DDT, aldrin, orthochlorinitrobenzene, tetralin, and other substances, some of which are known to be toxic , have been found in river water. Carcinogens and mutagens have been found in municipal wastes. Chloronitrobenzene discharged at St. Louis, demonstrable in drinking water in New Orleans, may relate to a triple rate of bladder cancer in New Orleans. Enteric virus levels in water may be reduced by adequate levels of free available chlorine (HOCl). Ozone is a promising virucidal agent. The problem of determining acceptable daily intakes of substances for humans is discussed. It is urged that renovated water be held in batches until toxicological evaluations have been made, and that standards at least as rigorous as those for new food and drug additives should apply to water. (Stein-North Carolina)
W73-15027

SLUDGE RECYCLING: THE MOST REASONABLE CHOICE,
Corps of Engineers, Washington, D.C.
T. Hinesly.
Water Spectrum, Vol 5, No 1, p 1-8, 1973. 2 illus, 7 photo.

Descriptors: *Waste treatment, *Anaerobic digestion, Sewage treatment, Sludge treatment, Ultimate disposal, Waste water treatment, Water pollution, Water pollution sources, *Recycling.

There is nothing really new or unusual about the concept of returning wastewater nutrients to the soil. The growing demand for clean water may be met in some measure with the recycling of waste products that would, if left in the water, be considered contaminants and if removed, would be considered valuable soil nutrients. Municipal sludge for example, if properly stabilized, can be used as either a reconditioner of barren soils or as a fertilizer for crops. The history of waste disposal is discussed emphasizing the developing technology of waste separation and treatment. The most frequently proposed alternative to sludge recycling, that of incineration, is discussed and its disadvantages are mentioned. Case studies, involving the use of digested sludges in agricultural production, in the U.S. and in Canada are mentioned and it is suggested that in the long run, the return in the form of improved land and production will provide adequate incentives for any municipal sanitary district to investigate such recycling methods. (Wadley-Florida)
W73-15140

FLORIDA COURTS AND WATER POLLUTION: A FLOATING CRAP GAME,
For primary bibliographic entry see Field 06E.
W73-15152

WASTE WATERS OF POTATO WASH AND PEEL INSTALLATIONS, (IN GERMAN),
L. Taeumer.
Z Gesamte Hyg Grenzgeb. Vol 18, No 3, p 194-197. 1972. Illus.
Identifiers: Installations, Pollution, *Potato wastes, *Waste water disposal, Industrial wastes, Waste water treatment.

Water requirements from both the supply and disposal standpoint for these installations were considered. Data are supplied on consumption vs. capacity, composition and treatment requirements, including disposal of liquid and solid wastes.--Copyright 1973, Biological Abstracts, Inc.
W73-15153

TECHNIQUES FOR THE SAMPLING AND HANDLING OF ANAEROBIC MICROBES IN WASTE FERMENTATION SYSTEMS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05A.
W73-15172

FEEDERS SCOLDED FOR FAILING TO LEARN THEIR 'MANURE ECONOMICS'.

Beef, Vol 9, No 7, p 43 66, March, 1973, 1 fig.

Descriptors: *Farm wastes, *Economics, Cattle, *Feedlots, *Waste disposal, *Fertilizer, Texas, Irrigation.
Identifiers: Retention ponds, Playa lakes.

In these excerpts from a speech given at U.S. Department of Agriculture Southwestern Great Plains Research Center, Bushland, Texas, feedlot operators are urged to become familiar with the economics of animal wastes used as fertilizers. The approximately one ton of manure a steer produces while in the feedlot is viewed as a liability by most feeders. Manure can be an economic opportunity for the operator who the effort to turn it into a marketable commodity. (Wetherill-East Central)
W73-15173

CATTLE FEEDLOTS AND THE ENVIRONMENT.
Environmental Protection Agency, Seattle, Wash., Region X.

April, 1972, 63p, 35 fig, 6 tab, 8 ref.

Descriptors: *Feed lots, *Design criteria, *Air pollution, *Water pollution, *Farm wastes, Lagoons, Runoff, Waste Disposal, Pacific Northwest U.S.
Identifiers: *Waste management, Site selection, Manure mounds.

Comprehensive guidelines are presented for the control and abatement of pollution originating from cattle feedlot operations. Feedlot wastes should be considered a natural resource capable of being recycled. Proper site selection, feedlot design, and management are needed to accomplish this. Site selection is the most important factor in minimizang water pollution. Guidelines call for feedlots to be isolated from waterways and outside of a 10 year flood plain. Feedlot design should retain all wastes on the premises until ultimate disposal. This may be done by manure mounds, holding ponds, or lagoons. Land disposal is currently the only industry-wide method acceptable for ultimate disposal of feedlot wastes. (Marquard-East Central)
W73-15175

FACILITY DESIGN,
Wilson and Co., Salina, Kans.
R. E. Crawford.
Design for Feedlot Waste Management, Presented at the Continuing Education Seminar: Topeka, Kansas, January 23, 1969; Hutchinson, Kansas, January 28, 1969, 14 p, 9 tab.

Descriptors: *Feed lots, Runoff, Water pollution control, *Design, *Farm wastes, Livestock, Hydrology, Precipitation, *Waste water treatment, Waste storage, *Waste disposal, Irrigation.
Identifiers: *Waste management facilities.

Runoff control is an integral part of feedlot operation and cost. The principal steps are collection, storage and/or treatment and ultimate disposal. Biochemical oxygen demand, chemical oxygen demand, and dissolved oxygen data were taken to determine streamflow conditions due to feedlot runoff. Runoff variables of size of feedlot, topography, stream location, and flow and precipitation patterns were studied. At present the use of a retention system appears to be the most economical solution to preventing stream pollution with feedlot runoff. Two general plans involving holding basins of ponds are examined in detail. (Wetherill-East Central)
W73-15176

INCLINED-PLANE TRICKLING FILTER FOR SWINE WASTE,
Georgia Univ., Athens. Dept. of Agricultural Engineering.
L. A. Mulkey, and R. E. Smith.
Paper No. 72-952 presented at 1972 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-15, 1972. Order No. M172-952, 16 p, 2 tab, 1 fig, 14 ref.

Descriptors: *Waste water treatment, *Aerobic treatment, Odor, *Trickling filters, Flow rates, *Biochemical oxygen demand, *Farm wastes, *Hogs, Feed lots, Operations.
Identifiers: Inclined plane, Contact time, Organic removal, Psychoda fly larvae, Design equations.

Operating results of an aerobic inclined plane trickling filter to treat swine wastes are reported. The results indicate that this device can be used as a component in a waste handling system. The organic removal is erratic due to Psychoda fly larvae but a definite relationship exists and the equation s/so±exp (-0.03L/Q) (where s/so±BOD concen-

tration ration, L± plane length in feet and Q± flow rate in gal/hr-ft) may be used as a design guide in waste handling systems. Contact time for wastewater and biological growth is determined by tc± 17.25 L/Q. Odor control was a desirable attribute of the system and actions of macroorganisms could aid in the transport of organic solids across the inclined plane. (Marquard-East Central)
W73-15179

EQUIPMENT AND FACILITIES FOR MODERN METHODS OF SWINE MANURE DISPOSAL,
A. J. Muehling.
Reports of the Twelfth Annual Swine Day, p 17-23, December, 1970, 8 fig.

Descriptors: *Farm wastes, *Waste disposal, *Hogs, Feed lots.
Identifiers: *Building design, *Slotted floors, Farrowing house, Construction methods, Nursury building, Finishing building, Sow confinement, Hog production systems.

The use of slotted floors in swine housing has accelerated the use of confinement housing in hog production systems in the United States. Specific facilities which are necessary for swing production and which successfully employ the slotted floor are described. Detailed instructions for constructing the farrowing house, nursery building, and finishing building are given. Concrete slotted floors appear to endure better than wood or steel. However, manure probably is worked through expanded metal better than almost any other slotted floor material. All types of slotted floor materials are considered. The advantages of various constructiion materials and methods are discussed. Floor plans and pictures depict the actual building structures and give additional construction information. (Dudley-East Central)
W73-15180

CLIMATE AND THE SELECTION OF A BEEF WASTE MANAGEMENT SYSTEM,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
A. F. Butchbaker, G. W. A. Mahoney, and J. E. Garton.
Paper No. 72-410 presented at 65th Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, 35 p, 10 fig, 1 tab, 28 ref.

Descriptors: *Climates, *Feed lots, *Waste disposal, *Cattle, Temperature, Moisture deficit, Aerated lagoons, Management, *Waste treatment.
Identifiers: *Site selection, *Beef housing system, Anaerobic lagoons.

Climate classifications are defined and climate effects on animals and waste management systems are discussed. Two climatological models for beef housing and waste management were developed to serve as a basis for delineating areas that require different beef housing and waste management practices. One used January and July temperature limits for beef production and moisture deficit. Beef housing and waste management systems were classified by climatological areas. Essentially, more humid areas require more complete housing and waste management systems. Areas of high moisture deficit are optimum for open feedlots. Areas above 60F require sunshades, and year-around disposal of wastes on croplands can be achieved. Areas below 45F require a higher degree of housing and storage facilities for winter wastes. (Marquard-East Central)
W73-15183

NITROGEN IN INDUSTRY,
National Environmental Research Center, Cincinnati, Ohio, Advanced Waste Treatment Research Lab.
J. B. Farrell.
Presented at symposium on Nitrogen in Soil and Water, Hespeler, Ontario, Canada, March 30-31, 1971, 14 p, 2 fig, 3 tab, 13 ref.

Descriptors: *Nitrogen, Industry, *Fertilizers, *Water pollution, Ammonia, Domestic animals, Urea, Activated carbon, Chlorination, Denitrification, *Industrial wastes, *Waste water treatment, Air pollution.
Identifiers: Nitric acid.

The extent of water pollution from industrial and fertilizer production sources is examined. Nitrogen from industrial production represents only a portion of the nitrogen distributed to water. Nitrogen water pollution from industrial sources is restricted to isolated point sources. Large tonnage processes produce nitrogenous effluents in gaseous forms thus causing air pollution and not water pollution. Small tonnage production, however, can lead to large quantities of nitrogen lost. Recovery is impractival because of the economies involved in separating nitrogen from the wastes. Nitrogen may be removed biologically by changing nitrogen to ammonia or nitrates, then through chlorination, ion exchange, or FeSO4 reduction can remove nitrogen entirely or convert it to a gas. (Marquard East-Central)
W73-15186

COMPREHENSIVE AREA-WIDE WATER AND WASTEWATER FACILITIES PLAN AND PROGRAM FOR THE MID-CUMBERLAND REGION OF TENNESSEE.
Barge, Waggoner, Sumner and Cannon, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 06B.
W73-15196

MUNICIPAL SEWAGE TREATMENT SYSTEMS--INVENTORY OF THE STRUCTURE AND FUNCTIONS OF RHODE ISLAND'S PUBLIC SEWAGE TREATMENT SYSTEMS.
Rhode Island Water Resources Board, Providence.

Water and Related Land Resources Planning Task No 4, September 1972. 198 p, 41 fig, 40 tab, 20 ref, glossary. WRC P.L. 89-80, Title III.

Descriptors: *Waste water treatment, *Planning, Coordination, Water policy, *Administration, *Rhode Island, *Sewage treatment, Treatment facilities, Regional development.
Identifiers: Waste water systems.

Structures and functions involved in the operation of Rhode Island's municipal liquid waste water facilities are described with emphasis on collection networks and treatment processes. Since all but one of the districts are municipally legislated and administered, treatment systems and collection networks are of varying sizes and efficiencies. Eleven of the fourteen systems treat waste water collected primarily from their own corporate limits. Five systems utilize a secondary treatment process, while the remaining nine employ a primary treatment process. Each system is detailed by (1) a literal description, (2) a tabular summary of population and treatment characteristics, and (3) a graphic illustration of existing and proposed collection network and treatment plant. As indicated by various proposed plans, the operation and organization of Rhode Island's sewer system should switch from single municipality systems to multi-municipality systems. Secondary treatment is also expected to become the norm, partially due to pressures from the Environmental Protection Agency. (Hoffman - North Carolina)
W73-15200

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA-ADDENDUM NO 2.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 05G.
W73-15201

PRELIMINARY SEWER STUDY, VREDENBURGH, ALABAMA,
Alabama-Tombigbee Rivers Regional Planning and Development Commission, Camden.
C. W. Himes.
Report No ALA-ATR-1770-1020-01. June 1973. 20 p, 11 fig, 2 tab. RX06-1020-0.

Descriptors: *Sewerage, *Sewers, *Alabama, Environmental effects, Sewage treatment, Pumping plants, Treatment facilities, Septic tanks, Cost
Identifiers: *Gravity flow, *Vredenburgh (Ala.), Utility extension, Mill town, Sanitary sewer system.

The feasibility of constructing a gravity flow sanitary sewer system for Vredenburgh, Alabama is examined. Town economy depends upon a lumber mill. Present methods of sewage disposal by septic tanks and outdoor toilets are unsatisfactory and unsanitary due to soil limitations in terms of permeability and drainage. A proposed gravity flow system of sanitary sewers would collect and carry sewage to the west side of town. A pumping station would be required to lift sewage into a nearby treatment plant. Estimated costs would be $70,160 for the disposal system and $20,000 for the pumping station, a total of $90,160. It is anticipated that the cost of this system (including a treatment plant) versus the possible benefits would preclude serious consideration of its construction. Vredenburgh's special status as a mill town with no taxation income precludes ordinary financing arrangements. Adequacy of the water system, which has no expansion capability or plans, is also discussed. A map showing possible location of sewer lines, and profile sheets with elevations, are included. (Edwards - North Carolina)
W73-15204

TREATMENT AND DISPOSAL OF INDUSTRIAL WASTEWATERS,
Thames Conservancy, London (England).
H. Fish.
Effluent and Water Treatment Journal, Vol 13, No 5, p 279-289, May 1973. 3 ref.

Descriptors: *Industrial wastes, *Waste water treatment, Costs, Cooling water, *Sewage treatment, Sewerage, Water quality control, *Waste water disposal.
Identifiers: Process water, *Great Britain, Modgen formula.

Industrial wastes are divided into four categories: (1) wastewaters changed in chemical quality by the manufacturing process, (2) cooling waters not significantly altered in chemical quality, (3) grossly contaminated wastewaters, wastechemicals, and sludges separated from the main wastewater stream, and (4) runoff from roofs and yards. Only the first two categories, which form the bulk of industrial wastes, are discussed. Trade effluents may be disposed by passing them on to some enterprise which can use them, disposal to public sewers, or discharge to surface waters after extensive treatment on the premises. It is explained why British policy is to encourage discharge to public sewers. Quality limitations on industrial discharges to public sewers are discussed. Pretreatment may be necessary prior to such discharges. Attention is given to determination of charges for treatment of industrial wastes and to monitoring and control of discharges. Industrial discharges to inland surface waters are declining, groundwater discharges are rare, but discharges to tidal waters remain appropriate and necessary. Finally, pre-discharge problems and processes used by particular industries are investigated. (Stein - North Carolina)
W73-15205

OLLUTION OF WATER,
epartment of the Environment, London (England). Water Engineering.
. H. A. Price.
ritish Water Supply, No 2, p 6-11, February 1973.

escriptors: *Water pollution, *Water quality, 'aste water treatment, Sewage, Estuaries, iodegradation, Detergents, Alkylbenyene sulonates, *Treatment facilities.
lentifiers: *Great Britain.

roduction of wastewater increases three percent nnually in Great Britain with character of wastes eing increasingly non-biodegradable. A medium zed sewage treatment plant serving 100,000 peoe may process about 1,800 mg annually, at a cost f 100 pounds per mg. A river pollution survey reorted that half the total length of rivers in Enand and Wales were in satisfactory condition, a uarter were not seriously polluted, but needed nprovement, a sixth were of poor quality, and an ghth were grossly polluted. A slight but signifiant improvement in river quality since 1958, espite increased wastes, is due to improved treatent plants. Untreated sewage discharges into ind water are virtually nil, although estuarial ischarges cause serious pollution. Some synthetic aterials do not easily decompose biologically. lkyl benzene sulphomote used in detergents is a lassic example. Residual surface active agents in ewage effluents after normal treatment has ropped from 35% to about 5%. Experimental ork is being done on use of activated carbon in ewage treatment and on detection and determinaon of micro-pollutants in river and drinking ater. Future needs may require dual supply ystems which will supply most industry with a ater quality necessary for its requirements, eserving cleaner water for domestic purposes and elected industries such as those concerned with ood and drink. (Stein - North Carolina)
W73-15207

THE WATER RECLAMATION WORKS AT WINDHOEK (SOUTH WEST AFRICA),
R. J. Clayton.
Aqua, No 3, p 14-18, 1972. 8 fig, 1 tab.

Descriptors: *Municipal water, *Waste water reatment, *Potable water, *Water reuse, *Sewage reatment, Water quality, Water resources, Water hortage, Water purification, Public health, Muicipal wastes, Multiple-purpose reservoirs, Costs, Treatment facilities.
Identifiers: *Southwest Africa (Windhoek).

Few rivers in South West Africa have a water discharge during the entire year, and frequently the groundwater is brackish, creating the problem of finding new water resources to meet increasing demands. Urban growth in the capital city of Windhoek created a need to find new methods of obtaining water that had become extraordinarily expensive. With the collaboration of the NIWR (National Institute for Water Research) and CSIR (Council for Scientific and Industrial Research), a system was developed for the reclamation of sewage water. The reclaimed water meets the requirements for potable water of the World Health Organization, and it is cheaper than natural water. Windhoek is the first city in the world to permanently use reclaimed water for domestic use as drinking water. Illustrations describe existing and installation of equipment and various units and their functions in the sequence of operation. The total capital cost of the reclamation works amounts to R207.000, although it does not include the cost of five additional maturation ponds and other expenses to be shared with sewage works. (Bahre-Ariz.)
W73-15214

ANIMAL WASTE DISPOSAL AND CONTROL OF FEEDLOT RUNOFF.
Agricultural Research Service, Lincoln, Nebr. Soil and Water Conservation Research Div.

Typescript, October 1971. 4 p, 29 ref.

Descriptors: *Feed lots, *Waste disposal, Runoff, *Water pollution, *Soil contamination, *Farm wastes, Cattle, Odor, Groundwater, Terraces, Sedimentation, Irrigation, Water table, Nitrates, *Nebraska.

Evaluation and control of soil and water pollution from cattle feedlots and studies of the factors affecting feedlot pollution potential are the objectives of research studies initiated at Lincoln, Nebraska in 1968. Emphasis is on waterborne materials, but attention is also given to air transport and odor problems. Terrain, water table, runoff, sedimentation, nitrate concentrations, and climatic factors are studied at four test sites. Soil core samples confirm that flat feedlots are not major contributors to groundwater pollution. No problems of nitrate or salt accumulations were discovered after application of runoff effluent to corn fields. Oxidation ditch studies have shown that, with aerobic maintenance of the ditch, odors are absent. Plans have been completed for two additional research sites. (Wetherill-East Central)
W73-15231

AN APPARATUS FOR THE REDUCTION OF TRITIUM EMISSIONS INTO THE ATMOSPHERE,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 05G.
W73-15257

IMPROVEMENT OF HYGIENIC CONDITIONS BY ORGANIZED WASTE, (IN GERMAN),
Institut fuer Kommunalwirtschaft, Dresden (East Germany).
M. Tosch.
Z Gesamte Hyg Grenzgeb. Vol 18, No 3, p 213-217, 1972, Illus.
Identifiers: Human wastes, Hygienic conditions, *Domestic wastes, *Waste disposal, *Recycling, Dumping, Water pollution.

The necessity of establishing a process of orderly deposition of residential waste is a consequence of the present practice of disorganized disposal. The term orderly deposition implies a stratiform deposit, with location, nature and preparation of the dumping facility in such a way that risks or nuisances in regard to water pollution and hygienic and esthetic respects are nearly fully excluded. A review is presented of 3 basic types of disposal, involving straight dumping, dumping after size reduction of solid waste, and decay processes. The basic form included deposition in pits, trenches or piles. Recycling steps and various degrees of mechanization may be incorporated.--Copyright 1973, Biological Abstracts, Inc.
W73-15275

5E. Ultimate Disposal of Wastes

DISPOSAL OF SUGAR REFINERY LAGOON EFFLUENTS BY SOIL SPREADING,
North Dakota State Univ., Fargo. Dept. of Bacteriology.
For primary bibliographic entry see Field 05D.
W73-14755

GEOLOGIC APPRAISAL OF PARADOX BASIN SALT DEPOSITS FOR WASTE EMPLACEMENT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-14820

ECOLOGICAL INVESTIGATION OF RADIOACTIVE MATERIALS IN WASTE DISCHARGE AREAS AT LOS ALAMOS FOR THE PERIOD JULY 1, 1972 - MARCH 31, 1973,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 05B.
W73-14981

WASTE WATERS OF POTATO WASH AND PEEL INSTALLATIONS, (IN GERMAN),
For primary bibliographic entry see Field 05D.
W73-15153

FEEDERS SCOLDED FOR FAILING TO LEARN THEIR 'MANURE ECONOMICS'.
For primary bibliographic entry see Field 05D.
W73-15173

CATTLE FEEDLOTS AND THE ENVIRONMENT.
Environmental Protection Agency, Seattle, Wash., Region X.
For primary bibliographic entry see Field 05D.
W73-15175

FACILITY DESIGN,
Wilson and Co., Salina, Kans.
For primary bibliographic entry see Field 05D.
W73-15176

EQUIPMENT AND FACILITIES FOR MODERN METHODS OF SWINE MANURE DISPOSAL,
For primary bibliographic entry see Field 05D.
W73-15180

CLIMATE AND THE SELECTION OF A BEEF WASTE MANAGEMENT SYSTEM,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W73-15183

TREATMENT AND DISPOSAL OF INDUSTRIAL WASTEWATERS,
Thames Conservancy, London (England).
For primary bibliographic entry see Field 05D.
W73-15205

ANIMAL WASTE DISPOSAL AND CONTROL OF FEEDLOT RUNOFF.
Agricultural Research Service, Lincoln, Nebr. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05D.
W73-15231

IMPROVEMENT OF HYGIENIC CONDITIONS BY ORGANIZED WASTE, (IN GERMAN),
Institut fuer Kommunalwirtschaft, Dresden (East Germany).
For primary bibliographic entry see Field 05D.
W73-15275

5F. Water Treatment and Quality Alteration

A MULTI-POISSON DISTRIBUTION MODEL FOR THE TREATMENT OF DISINFECTION DATA,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05D.
W73-14788

APPLICATION OF MULTI-POISSON DISTRIBUTION MODEL FOR THE TREATMENT OF VIRUCIDAL AND BACTERICIDAL DATA,
Cincinnati Univ., Ohio.

For primary bibliographic entry see Field 05D.
W73-14789

COMPARATIVE DEATH KINETICS OF INDICATOR MICROORGANISMS UPON HALOGEN DISINFECTION,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-14790

THE COMPARATIVE MODE OF ACTION OF CHLORINE, BROMINE, AND IODINE ON F2 BACTERIAL VIRUS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health.
For primary bibliographic entry see Field 05D.
W73-14792

BROMINE, CHLORINE, AND IODINE COMPARED AS DISINFECTANTS FOR AMOEBIC CYSTS,
Johns Hopkins Univ., Baltimore, Md. School of Hygiene and Public Health.
For primary bibliographic entry see Field 05D.
W73-14795

DISINFECTION OF WATER AND WASTEWATER USING OZONE,
Crane Co., King of Prussia, Pa. Cochrane Div.
For primary bibliographic entry see Field 05D.
W73-14796

ECONOMICAL WASTEWATER DISINFECTION WITH OZONE,
Grace (W.R.) and Co., Baltimore, Md. Davison Chemical Div.
For primary bibliographic entry see Field 05D.
W73-14797

THE CHEMISTRY OF AQUEOUS NITROGEN TRICHLORIDE,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 05B.
W73-14800

KINETICS OF TRIBROMAMINE DECOMPOSITION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
T. Lapointe, J. Hsu, and J. D. Johnson.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 53, p 192-197, 1973. 3 fig, 14 ref.

Descriptors: *Disinfection, *Bromine, *Water treatment, Chlorination, Waste water treatment, Water chemistry, Chemical reactions, Kinetics, Swimming pool.
Identifiers: *Bromamines.

Bromine functions as a disinfectant in the free form or in combined forms such as mono-, di- or tribromamine. Bromine also offers several advantages over chlorine as a disinfectant of swimming pools. Even relatively high concentrations of bromine fail to produce the eye irritation and odor found with chlorinated pools. Bromine is a superior algicide for a number of species of algae. Tribromamine, NBr3, is of particular interest because it is the most stable of the bromamines under conditions of typical breakpoint bromination. A series of experiments at pH 7.1 then showed that under conditions of reduced bromide concentration the rate of the decomposition is significantly decreased. A second order rate constant is calculated from this experiment. (Knapp-USGS)
W73-14801

RECYCLE, WHAT DISINFECTANT FOR SAFE WATER THEN,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-14802

DECHLORINATION BY ACTIVATED CARBON,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-14803

DESIGN OF ACTIVATED CARBON ADSORBERS FOR AQUEOUS CHLORINE REMOVAL BASED ON THE MECHANISM OF REMOVAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
L. L. Olson, and C. D. Binning.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 56, p 213-217, 1973. 1 fig, 9 ref.

Descriptors: *Chlorination, *Activated carbon, *Water treatment, *Waste water treatment, Disinfection, Water chemistry, Absorption, Design, Aqueous solutions.
Identifiers: *Dechlorination.

Superchlorination followed by dechlorination is commonly used in military ships and also as a means of supplying safe water to farmers or other people not connected to municipal supplies. This method of water treatment also serves as an effective means for removing those substances that cause tastes and odors. In addition, the chlorine serves as an oxident for dissolved ferrous iron with its subsequent precipitation and removal on an appropriate filter system. Dechlorination can be achieved in a number of ways, but the method most commonly used is to pass the aqueous chlorine solution over a bed of activated carbon. The chlorine is removed from solution, as well as taste and odor causing compounds, and the water is delivered to the tap free of tastes and odors associated with chlorinous organic compounds and free of bacterial contamination. (Knapp-USGS)
W73-14804

DISINFECTION OF WASTEWATER EFFLUENTS FOR VIRUS INACTIVATION,
Maryland Univ., College Park.
For primary bibliographic entry see Field 05D.
W73-14806

HEPATIC AMOEBIASIS IN CEYLON,
Colombo North Hospital (Ceylon).
For primary bibliographic entry see Field 05C.
W73-14897

HANDBOOK OF CHLORINATION FOR POTABLE WATER, WASTEWATER, COOLING WATER, INDUSTRIAL PROCESSES, AND SWIMMING POOLS,
G. C. White.
Van Nostrand Reinhold Co., New York/Cincinnati/Toronto/London/Melbourne, 1972. 744 p, Price: $37.50.

Descriptors: *Chlorine, *Chlorination, *Disinfection, *Water treatment, Water types, *Potable water, Industrial water, Sea water, *Swimming pools, *Cooling water, Bromine, Halogens, Iodine, Ozone, Water utilization, Ultraviolet radiation, Chemistry, Operation and maintenance, Safety, Water quality control, Water purification, Chemicals, Treatment facilities, Industrial wastes, Analytical techniques, Water analysis.
Identifiers: Silver, Silver compounds, Hypochlorites, Chlorine dioxide, Chlorine compounds, *Handbooks.

The thirteen chapters of this practical handbook and engineering reference text describe the history, manufacture, and properties of chlorine (Cl), the design, operation, maintenance, and safety aspects of Cl generating equipment and chlorination installations, the determination of residual Cl in treated waters, the disinfection of drinking water, cooling water, swimming pools, industrial waste waters, and seawater, especially aboard ships, other applications of Cl in food packaging, fish and poultry processing, potato starch conversion, aluminum fluxing, pulp bleaching, and papermaking; and other disinfection methods and chemicals, notably chlorine dioxide, hypochlorite, bromine, iodine, silver, ozone, and ultraviolet irradiation. Useful nomograms and tables are appended, along with a subject index. Bibliographic citations to the pertinent literature are appended to each chapter. (Brown-IPC)
W73-14915

USE OF MIXED MEDIA IN WATER PLANT FILTRATION,
Mead Corp., Kingsport, Tenn.
For primary bibliographic entry see Field 05D.
W73-14924

CHLORINATED URBAN WATER: A CAUSE OF DIALYSIS-INDUCED HEMOLYTIC ANEMIA,
Minnesota Univ., Minneapolis. Coll. of Medical Sciences.
J. W. Eaton, C. F. Kolpin, H. S. Swofford, C-M. Kjellstrand, and H. S. Jacob.
Science, Vol 181, No 4098, p 463-464, Aug 3, 1973. 2 fig, 13 ref.

Descriptors: *Chlorination, *Water purification, *Public health, Potable water, Diseases, *Bactericides, *Municipal water, *Water treatment, Dialysis, Disinfection, Water types, Hazards, Organic compounds, Biological properties, *Human diseases.
Identifiers: *Anemia, *Chloramines, Chlorine compounds, Blood, Uremia, Clinical cases, Hospitals.

Unexplained acute hemolytic anemia is sometimes found in uremic patients undergoing hemodialysis. Chloramines, which are widely used as bactericides in urban water supplies, have been found responsible for two recent epidemics of acute hemolytic anemia characterized by Heinz bodies in dialyzed uremic patients. Chloramines produce denaturation of hemoglobins both by their direct oxidant action and by their ability to inhibit red cell reductive (hexose monophosphate shunt) metabolism. (Brown-IPC)
W73-14928

GREAT LAKES PAPER EXTERNAL FEEDWATER SYSTEM FOR HIGH-PRESSURE BOILERS,
Great Lakes Paper Co. Ltd., Thunder Bay (Ontario).
R. H. Dahlin.
Pulp and Paper Magazine of Canada, Vol 73, No 11, p 102-104 (Technical Paper T352), Nov 1972. 4 fig, 1 tab.

Descriptors: Treatment facilities, *Boilers, *Pulp and paper industry, *Water treatment, Treatment, Filters, Equipment, Ion exchange, Anion exchange, Cation exchange, Separation techniques, Demineralization, Rivers, Running waters, Municipal water, Water types, Steam, Freshwater, Pressure, *Canada, *Waste water treatment.
Identifiers: *Kam River (Ontario), Sand filters, Feedwater, Recovery furnaces, Black liquor, Spent liquors, Kraft mills, Condensates.

The water treatment plant described makes use of sand and gravel filters, organic traps filled with high-porosity anion-exchange resins, and a demineralizer comprising both cation- and anion-

xchangers. The installation can process either iver water (from the Kam River) or city water from Fort Williams) to feed the high-pressure 850-psi) boilers in the main steam generating lant, as well as the black liquor recovery boiler of he kraft pulp mill at Great Lakes Paper Co. The acilities can also be used to polish return condenates. (Brown-IPC)
V73-14930

ECYCLED WATER POSES DISINFECTANT ROBLEM.
or primary bibliographic entry see Field 05D.
V73-14943

REATMENT OF SODA RECOVERY BOILER EEDWATER WITH TRILON (TRILONNAYA OBRABOTKA KOTLOVOI VODY ODREGENERATSIONNYKH AGREGATOV),
Orgbumdrev, Leningrad (USSR).
For primary bibliographic entry see Field 05D.
V73-14949

METHOD FOR PURIFICATION AND DISINFECTION OF SURFACE WATERS BY MEANS OF LOW-FREQUENCY ALTERNATING CURRENT (METODA PENTRU EPURAREA SI DEZINFECTAREA APELOR DE SUPRAFATA CU AJUTORUL CURENTULUI ALTERNATIV DE JOASA FRECVENT A),
Alexandru Ion Cuza Univ., Iasi (Rumania).
. N. Ciochina, M. M. Marcu, L. Alexa, C. Simionescu, and M. Cotrau.
Analele Stiintifice ale Universitatii 'Al. I. Cuza' din Iasi, Serie Noua, Sectiunea I, c. Chimie, Vol 3, No 2, p 231-236 plus 1 plate, 1972. 4 tab, 2 fig, 3 ref.

Descriptors: *Electrolysis, *Water purification, *Potable water, *Treatment facilities, Water types, Alternating currents, Direct currents, Electrochemistry, Electric currents, Phenols, Disinfection, Foreign research, Europe, *Water treatment.
Identifiers: Romania.

Contrary to earlier observations on the electrolysis of drinking water with direct current, in which large volumes of phenol derivatives were evolved, only small amounts of phenols were found even upon prolonged disinfecting treatment with low-frequency alternating current, using aluminum electrodes. Small water-treating units for household use are deemed feasible. (Brown-IPC)
W73-14957

HEALTH CONSIDERATIONS IN RENOVATING WASTE WATER FOR DOMESTIC USE,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 05D.
W73-15027

MONITORING THE DOSE OF FLUORINE IN FLUORIDATION OF DRINKING WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 05A.
W73-15089

CONTROLLING IRON AND COPPER DEPOSITS IN MODERN HIGH-PRESSURE BOILERS,
J. D. McWilliam.
Pulp and Paper Magazine of Canada, Vol 73, No 11, p 53-56, Nov 1972, 4 fig, 3 tab.

Descriptors: *Additives, *Boiler feed water, *Water treatment, *Pulp and paper industry, Boilers, Neutralization, Demineralization, Ion exchange, Cation exchange, Chelation, Scaling, Organic compounds, Corrosion, Piping systems (Mechanical), Silica, Heated water, Canada, *Copper compounds, Calcium compounds, Magnesium compounds, *Iron compounds.
Identifiers: Amines, Ethylenediamine tetraacetic acid, Depostis.

In addition to conventional water treatments for removal of Si, Ca, and Mg compounds, modern high-pressure boilers, such as those used in pulp and paper mills, require treatment with neutralizing and filming amines, condensate polishers (mixed-bed demineralizers or sodium-base cation-exchange resins), as well as chelating agents to remove the corrosive Fe and Cu compounds responsible for hot-side boiler tube deposits. Practical examples of boiler feedwater treatments and boiler cleaning measures are given. Thus, heavy scales composed of 30-40% Fe oxide, 20-25% organics, and typical Ca and Mg salts in a 600-psig boiler could be significantly reduced at an Ontario pulp and paper mill by treating the feedwater (0.3 ppm hardness) with 6 ppm of ethylene-diamine tetraacetic acid (EDTA). (Brown-IPC)
W73-15187

THE BACTERIOLOGICAL EXAMINATION OF WATER SUPPLIES.
Department of Health and Social Security, London (England); and Ministry of Housing and Local Government, London (England).

Reports on Public Health and Medical Subjects No 71, 1969. 52 p, 3 fig, 3 tab, 3 append, 73 ref.

Descriptors: Chemistry, Chemical reactions, Bacteria, *Aquatic bacteria, Coliforms, Sampling, Technology, *Water supply, *Public health, *Water treatment, Pollutant identification.
Identifiers: *Bacterial examination, United Kingdom.

The principles of bacteriological examination and proper interpretation of the results; frequency of examinations; proper sampling procedures; and techniques to assure the efficiency of laboratory practice and comparability of results are discussed. The differentiation between water leaving the waterworks after treatment and samples taken from the distribution system is discussed since a number of factors may cause a deterioration in the supply enroute to the consumer. The importance of continual checks on the efficiency of chlorination is stressed. (Hunt-NWWA)
W73-15191

METROPOLITAN DISTRICT WATER SUPPLY SYSTEM, HARTFORD, CONNECTICUT: DESIGN FEATURES OF THE WATER TREATMENT PLANT AT RESERVOIR SIX,
Hartford Metropolitan District Water Bureau, Conn.
H. A. Phillips, and P. J. Revill.
Journal of New England Water Works Association, Vol 87, No 1, p 22-35, March 1973. 2 maps.

Descriptors: *Water treatment, *Treatment facilities, *Sewage treatment, *Filtration. Settling basins, Qualtiy control, *Connecticut, Sludge, Cities, Urbanization.
Identifiers: *Rapid sand filtration, Wash water, *Hartford (Conn).

Future growth of both suburban and rural communities in the Hartford region threaten the isolation of watersheds and reservoirs. This potential pollution, coupled with the continued stringency of recommended water quality standards by the U. S. Public Health Service, necessitated the decision to build a new water treatment plant at Reservoir Six. The rapid sand process of filtration was chosen because of advantages of flexibility of operation, ease of automation, reduced space requirements, and lower construction costs. Design specifications and features of the new plant, together with an explanation of the present water supply system and integration of the new plant with the existing system, are presented. The plant was designed to be built in stages. The first stage, now complete, has a nominal capacity of 20 m.g.d. The final plant will have an 80 m.g.d. design capacity. The process by which raw water is treated is detailed. Wash water and sludge from the filters is carried into decanting basins where the dirty water is allowed to clarify by settling and the supernatent water is drawn off and pumped back into the reservoir. The remaining sludge can then either be dried, put into tanks or disposed elsewhere. (Hoffman - North Carolina)
W73-15206

CONSIDERATIONS IN THE ASSESSMENT OF THE CONSEQUENCES OF EFFLUENTS FROM MIXED OXIDE FUEL FABRICATION PLANTS. ENVIRONMENTAL CONSIDERATIONS AFFECTING CONSEQUENCES OF RELEASES,
Battelle-Pacific Northwest Lab., Richland, Wash.
For primary bibliographic entry see Field 05B.
W73-15241

YERSINIA ENTEROCOLITICA IN DRINKING--WATER,
Statens Institutt for Folkehelse, Oslo (Norway).
For primary bibliographic entry see Field 05A.
W73-15274

SANITARY CONDITIONS OF WELLS ON HIGHWAYS OF THE VINNITSA DISTRICT AND MEASURES TO IMPROVE THEIR WATER QUALITY, (IN RUSSIAN),
P. N. Maistruk, and G. I. Konakhovskii.
Gig Sanit, Vol 37, No 4, p 98-99, 1972.
Identifiers: *Chlorine, Highways, Sanitary conditions, *USSR, *Water wells, Water quality, Water treatment.

Immediate measures were required to improve the sanitary conditions of the wells on highways of the Vinnitsa district (USSR). One measure was the prophylactic decontamination of the water by lowering C1-releasing cartridges into the wells. The use of these cartridges filled with chlorinated lime and recharged every 30-35 days, generally had a favorable effect.--Copyright 1973, Biological Abstracts, Inc.
W73-15276

5G. Water Quality Control

ANNUAL REPORT OF ACTIVITIES DURING FISCAL YEAR 1973.
Maine Univ., Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 09D.
W73-14752

LOCATION, IDENTIFICATION, AND CHARACTERIZATION OF PATHOGENS OF THE WATER HYACINTH,
Florida Univ., Gainesville. Dept. of Plants Pathology.
For primary bibliographic entry see Field 05C.
W73-14758

ENERGY AND FLOW REQUIREMENTS FOR CHOPPING WATER HYACINTHS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-14759

ALLEVIATION OF LAKE POLLUTION BY UTILIZATION OF AQUATIC PLANTS FOR NUTRITIONAL, MEDICINAL OR INDUSTRIAL PURPOSES,
Minnesota Univ., Minneapolis. Dept. of Pharmacognosy.

For primary bibliographic entry see Field 05A.
W73-14764

SIMULATION OF THE QUANTITY AND QUALITY OF FLOW IN A RIVER BASIN,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 02A.
W73-14765

PUBLIC INVESTMENT CRITERIA FOR WATER ORIENTED RECREATION IN THE LAKE ERIE BASIN,
Ohio State Univ., Columbus. Dept. of Economics.
For primary bibliographic entry see Field 06D.
W73-14774

MAPPING HYDROCARBON SEEPAGES IN WATER-COVERED REGIONS,
Shell Oil Co., New York. (assignee)
E. R. Fort, B. O. Prescott, and A. Walters.
U. S. Patent No. 3,747, 405, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 912, No. 4, p 1315, July 24, 1973.

Descriptors: *Patents, Surveys, *Mapping, *Oil pollution, Seepage control, *Organic compounds, Water pollution control, Water quality control, *Pollution abatement, Natural resources, Oil.
Identifiers: Natural oil seepages.

A process is described for exploring a water-covered region to compose a map of concentration with areal location of hydrocarbons that seep into the water from subterranean deposits. A sampling vehicle is towed at measured distances behind the survey vessel at measured distances above the bottom of the body of water while its depth is adjusted as required to keep it generally within a selected relatively short distance above the bottom. Water is pumped to the survey vessel at a substantially constant rate and is periodically analyzed. The records can be stored in the form of digital or analog electrical or visible representations. (Sinha-OEIS)
W73-14776

METHOD OF RECOVERING OIL FROM A WATER SURFACE,
Johns-Manville Corp., New York. (assignee)
W. G. Ekdahl.
U. S. Patent No. 3,747,760, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 912, No. 4, p 1406, July 24, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Separation techniques, Water pollution control, Water quality control, *Pollution abatement.

Oil on the surface of water is confined within a barrier effecting relative movement between the barrier and the water to form a head-wave along a leading edge of the confined oil which extends between the sidewalls of the barrier. The innovation comprises locating oil removal apparatus at the head-wave and removing oil from the head-wave. Oil is pumped from the surface of the water through inlets of the removal apparatus. The oil-water mixture is discharged through hoses to a barge or vessel having means to store and/or dispose of it. As oil is removed from the head-wave, the depth of the head-wave is reduced, and approaches the thickness of the remaining portion of the confined oil. The tendency of the water to scrub off globules of oil from the head-wave is minimized by reducing the profile of the oil-water interface and the pressures tending to force the oil down and beneath the barrier where the head-wave meets the barrier are also minimized. (Sinha-OEIS)
W73-14777

METHOD AND MEANS FOR THE WATER TRANSPORT OF LIQUIDS,
M. J. E. Golay, and A. H. Waite, Jr.
U. S. Patent No. 3,698,339, 7 p, 41 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 903, No 3, p 832, October 17, 1972.

Descriptors: *Patents, *Navigation, *Ice cover, *Transportation, Water pollution control, Water quality control, *Oil pollution.
Identifiers: Oil transport, Shipping.

The water transport of liquids, particularly oil through ice-choked waters, is described. A means for navigating ice-covered waters is capable of cutting through ice of substantial thickness or can travel beneath the ice in waters of adequate depth. The water transport is achieved by a submersible water craft which may be self-propelled or towed and which is separable into segments. Each segment has the ability to compensate for buoyancy and for shifting the segments one relative to the others to facilitate assembly and disassembly of a single unit. (Sinha-OEIS)
W73-14780

VIRUS INACTIVATION BY CHLORINE DIOXIDE AND ITS APPLICATION TO STORM WATER OVERFLOW,
Syracuse Univ., N.Y.
For primary bibliographic entry see Field 05D.
W73-14798

TESTING OF METHODS FOR DETERMINATION OF URBAN RUNOFF,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-14835

WATER RESOURCES AND UTILIZATION (VODA--RESURSY I POTREBLENIYE),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 06B.
W73-14846

PROTECTION OF WATER BODIES IN THE USSR FROM POLLUTION (OKHRANA VODOYEMOV V SSSR OT ZAGRYAZNENIYA),
P. N. Shternov.
Vodnyye Resursy, No 1, p 163-172, 1972.

Descriptors: *Water law, *Legislation, *Water pollution control, *Water quality standards, *Water conservation, Water utilization, Water resources, Administrative decisions, Administrative agencies, Institutions.
Identifiers: *USSR.

In the USSR the protection of water from contamination is regulated by the Principles of Water Legislation of the USSR and Union Republics as well as by water codes of Union-Republic water law. A brief account is given of water-conservation legislation in the USSR (in chronological order) and of major party and state decrees on water pollution control. Emphasis is placed on the role of scientific investigations in the solution of problems relating to complex use and conservation of water resources, and basic trends in the conservation of water in the USSR are outlined. The present organization of state supervision over the utilization and conservation of water is examined, and the participation of public organizations in the implementation of measures for the utilization and conservation of water is described in terms of the general nature of this assistance to state agencies. (Josefson-USGS)
W73-14853

EFFECTS OF SANITARY LANDFILLS ON GROUND AND SURFACE-WATER MOVEMENT AND WATER QUALITY,
Indiana Univ., Bloomington Dept of Geology
For primary bibliographic entry see Field 05B
W73-14859

FACTORS AFFECTING INNOVATION IN WATER QUALITY MANAGEMENT: IMPLEMENTATION OF THE 1968 MICHIGAN CLEAN WATER BOND ISSUE,
Michigan Univ., Ann Arbor. Dept of Civil Engineering.
S. L. Yaffee, and J W Bulkley
Available from the National Technical Information Service as PB-224 057, $5 75 in paper copy, $1.45 in microfiche Completion Report, August 1973. 233 p, 18 fig, 1 tab, 117 ref. OWRR A-054-MICH (1). 14-31-0001-3522.

Descriptors: *Water Quality, *Management, Water resources, Planning, Legal aspects, Legislation, Michigan, State governments, Water quality standards, Bond issues, Water pollution control, Administration, Attitudes, Social impact, Social values, *Comprehensive planning.
Identifiers: *Michigan 1968 Clean Water Bond Issue, Huron River Interceptor Case, Muskegon County Case, *Innovation.

This report focuses upon factors affecting innovation in the implementation of the 1968 Michigan Clean Water Bond Issue. The Joint Legislative Committee on Water Resources Planning which sized the Bond Program did not consider nutrient removal or any treatment beyond secondary in its determination of the fiscal resources necessary to meet 1980 Water Pollution Control objectives. Consequently, the fiscal resources were limited from inception. Innovation which would be responsive to changing conditions is resisted by the inherent desire for maintenance of the status quo and resistance of actions which involve uncertainity and non-programmed decision making. Administrative fragmentation provided limited perspective on the water quality problem. Technological obsolescence in administrative agencies resisted innovative solutions. An ineffective and noninnovative planning process dominated implementation of the Bond Issue funds. Four case studies demonstrating the inherent resistance to innovation led to a suboptimization of systemic pollution control goals, a reliance upon the interceptor-centralized plant model of regionalization, and basically a lack of incentives which promote planning and comprehensive analysis. The net effect of the Clean Water Bond program maintains a 1968 status quo situation. Factors resisting innovation are identified. Factors enhancing innovation are identified. An automated information storage/retrieval system for monitoring wastewater treatment facility funding is developed. Structural and process changes for future innovation are recommended.
W73-14871

CONTROL OF RESERVOIR EUTROPHICATION,
Fairfax County Water Authority, Annandale, Va.
F. F. Eunpu.
Journal of the American Water Works Association, Vol 65, No 4, p 268-274, 1973. 3 fig, 6 tab, 5 ref.

Descriptors: *Reservoirs, *Eutrophication, *Water quality control, *Anaerobic conditions, *Virginia, Aeration, Water pollution sources, Taste, Odor, Pollutants, Technology, Dissolved oxygen, Destratification, Annual benefits, Activated carbon, Monetary benefits, Chlorine, Hydrogen sulfide, Algal control, Copper sulfate, Manganese.
Identifiers: Fairfax County (Va.), Occoquan Reservoir (Va.).

The Fairfax County (Virginia) Water Authority embarked upon a program in 1969 to investigate methods for improving the raw water quality in its Occoquan Reservoir by eliminating existing eutrophic conditions using water aeration. The primary objective was to relieve the anaerobic conditions that existed during the summer in the lower portions of the reservoir adjacent to the water supply intake. Sampling results for temperature, dissolved oxygen, and inorganic phosphorus and nitrogen are shown. After evaluating various methods of aerating to eliminate thermal stratification, it was concluded that a reservoir turnover system would provide the desired results. Aeration of the lower portion of the Occoquan Reservoir has retarded eutrophication and provided the following benefits: elimination of anaerobic conditions and the resultant generation of hydrogen sulfide; reduction in the amount of chlorine required to oxidize organic materials; reduction in the amount of activated carbon required to combat taste and odor problems; uniform temperature and water quality at the raw water intake; some manganese removal through oxidation; ability to draw from the bottom intake because of improved quality; no prolific algal growths since aeration was begun and algicide was used in the upper areas. (Jones-Wisconsin)
W73-14886

THE EFFECTS OF HARVESTING AQUATIC MACROPHYTES ON ALGAE,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.
W73-14888

EUTROPHICATION CONTROL: NUTRIENT INACTIVATION BY CHEMICAL PRECIPITATION AT HORSESHOE LAKE, WISCONSIN,
Wisconsin Univ., Madison.
J. O. Peterson, J. P. Wall, T. L. Wirth, and S. M. Born.
Wisconsin Department of Natural Resources, Madison, Technical Bulletin No 62, 1973. 20 p, 15 fig, 14 tab, 12 ref, 2 append.

Descriptors: *Eutrophication, *Water pollution treatment, *Nutrient removal, *Chemical precipitation, Flocculation, *Wisconsin, Phosphorus, Lakes, Environmental effects, Water quality control, Algae, Costs, Benefits, Application methods, Equipment, Manpower, Aluminum.
Identifiers: *Nutrient inactivation, *Horseshoe Lake (Wis.), Alum, Ecological impacts.

A demonstration of phosphorus inactivation by chemical precipitation was conducted in eutrophic Horseshoe Lake, Wisconsin, to determine suitable techniques, document effects of the precipitating agent on water chemistry and the algal community of the lake, and determine application costs and benefits or improvements that may accrue. Alum (aluminum sulfate) was used as a method representing an extrapolation of advanced waste treatment technology where phosphorus is removed by precipitation, sorption, and physical entrapment and sedimentation in a flocculant aluminum hydroxide precipitate. The 22-acre, 55-ft deep lake was treated in 1970 by application of approximately 11 short tons of slurried alum distributed in its upper two feet of water. Alum concentrations in the treated volume were about 200 mg/l which resulted in maximum phosphorus removal with minimal ecologic risk. The treatment results were a decrease in total phosphorus, no increase in total phosphorus in the anoxic hypolimnion during the following summer's stratification, some increase in water transparency, a short-term decrease in color, absence of nuisance planktonic blooms, improvement in dissolved oxygen, especially during the following two winters, and no observable adverse ecological consequences. Application methods, description of equipment, and costs are given. (Auen-Wisconsin)
W73-14889

MAJOR CAUSE OF ALGAE AND WEEDS IN LAKE MENDOTA,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.
W73-14895

ATMOSPHERIC REAERATION IN NATURAL STREAMS,
Nebraska Natural Resources Commission, Lincoln. Data Bank.
For primary bibliographic entry see Field 05B.
W73-14896

ECONOMIC MODELS OF INDUSTRIAL POLLUTION CONTROL IN REGIONAL PLANNING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
D. P. Tihansky.
Environment and Planning, Vol 5, p 339-356, 1973. 5 fig, 2 tab, 24 ref, 1 append.

Descriptors: *Model studies, *Linear programming, *Stochastic processes, Economics, Industries, *Waste disposal, *Pollution abatement, Water quality, Streams, Treatment, Standards, Optimization, Regions, Air pollution, Constraints, *Regional analysis, Systems analysis.
Identifiers: *Nonlinear programming, Environmental quality, Regional planning.

A general theoretical model is presented for determining optimal regional growth and pollution control levels over a multiperiod time horizon. The problem is stated as the maximization of total profits of regional firms subject to constraints of ambient environmental quality and resource scarcity for production and abatement facilities. It is assumed that, in the region under consideration, maximally-allowed pollution loads are defined at sampling points in the atmosphere and streams. The model assumes that environmental quality is stochastic by incorporating variable factors of dilution or assimilation in the constraint set. This model is expressed as a stochastic nonlinear programming problem which by suitable mathematical transformations is reduced to a deterministic linear programming model; optimization problems involve the maximization of a linear profit function subject either to linear constraints, if all variables are deterministic, or nonlinear but separable constraints, if the model is extended to include stochastic features. The effects of random meteorologic and hydrologic conditions within joint chance constraints are examined, and theory on stochastic programming is developed to solve the model. Solutions to the model show the economic impacts of uniform versus efficient treatment standards, time delays on waste control enforcement, and statistical properties of the dilution factors. (Bell-Cornell)
W73-14904

SIMULATION AND OPTIMIZATION OF ACID MINE DRAINAGE ABATEMENT ALTERNATIVES,
Water Resources Engineers, Inc., Springfield, Va.
G. K. Young, R. S. Taylor, and J. S. Selekof.
Available from the National Technical Information Service as AD-757 782, $6.00 in paper copy, $1.45 in microfiche. Prepared for U.S. Army Corps of Engineers, Baltimore, Md., January 1973. 168 p, 52 fig, 6 tab, 22 ref, 2 append. DA CQ 31-72-C-0055.

Descriptors: *Simulation analysis, *Optimization, *Acid mine water, Drainage, *Pollution abatement, *Alternative planning, Costs, Water quality control, Standards, Mathematical models, Economic prediction, Decision making, Computers, River basins, Streamflow, Treatment, Hydrologic data, Systems analysis, *Pennsylvania, *Mine drainage.
Identifiers: *Tioga River basin (Pa.).

An approach for evaluating the water quality and economic consequences of alternative abatement plans for a river basin is presented. The approach utilizes a simulation model for acid mine drainage which is operated upon by an optimization technique. A water quality simulation model capable of routing acid mine drainage through a river basin is developed; the model simulates the quality and flow conditions resulting from different abatement programs and assesses the impact on the stream quality of abating different sources or a combination of sources. The model can monitor the water quality, measured in terms of total net alkalinity and pH, at control or decision points selected by the user. An economic optimization model is constructed which uses the simulation model as a subroutine and manipulates possible abatement alternatives. The objectives are: (1) optimum water quality at minimum annual cost; and (2) optimum water quality given an annual budget. The optimization model uses both random and deterministic techniques. The approach is applied to a case study of the Tioga River basin. (Bell-Cornell)
W73-14913

A GENERAL PERSPECTIVE CONCERNING THE COST OF POLLUTION ABATEMENT AT ANY SPECIFIED LEVEL,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-14921

KRAFT MULTISTAGE BLEACH PLANT EFFLUENTS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05B.
W73-14922

PROGRAM ATTACKS LAND, WATER, AIR POLLUTION.
For primary bibliographic entry see Field 05D.
W73-14936

IAEA RESEARCH CONTRACTS, THIRTEENTH ANNUAL REPORT.
International Atomic Energy Agency, Vienna (Austria).

Available from INIS Section, Division of Tech. Inf., International Atomic Energy Agency, Karntner Ring 11 (PO Box 590), A1011 Vienna, Austria. Technical Reports Series No 144, 1973. 237 p.

Descriptors: *Radioisotopes, *Nuclear wastes, *Contracts, *Research and development, Absorption, Sediments, Tracers, Waste disposal, Waste assimilative capacity, Waste treatment, Waste water (Pollution), Soil properties, Environmental effects, Sediment transport, Estuarine environment, Instrumentation, Europe, Radioecology, *Path of pollutants.

This volume contains 1-to-6-page summaries of reports received during 1972. (Microfiche copies of the complete reports may be obtained for $0.65 per document.) A listing of environmental-related (shortened) titles include: Report No. 428, sorptive reactions of soil; No. 610, sorbents for wastes; No. 640 cation-exchange treatment of wastes; No. 645, burial of radioactive asphalts; No. 923, solar evaporation of radioactive sludges; No. 702, use of Hg203 labelled organics to study Hg in the hydrosphere; No. 644, tracer methods for sediment transport; No. 826, aquifer studies using environmental C14; No. 757, radionuclide uptake by marine organisms and sediments; No. 871, radioisotopes in the North Sea and in estuaries; No. 880, detection of Pu and U in effluents. (Bopp-ORNL)
W73-14960

TRITIUM CONTROL TECHNOLOGY,
General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
W. E. Ward.
Available from NTIS, Springfield, Va., as GEPP-104; $4 in paper copy, $1.45 in microfiche. Report GEPP-104, July 1973. 22 p, 6 ref. AEC-AT- (29-2)-656.

Descriptors: *Tritium, *Waste disposal, *Radioactive wastes, *Instrumentation, Gamma rays, Absorption, Monitoring, Pollution abatement, Water pollution control, Air pollution, Cements, Underground waste disposal, Safety, Sampling, Industrial wastes, Hazards, Public health, Water vapor, Desiccants, Moisture uptake, Transfer.

Equipment for handling and containing tritium and for protection of personnel and the environment against contamination is discussed. Atmospheres are monitored by 22-liter Kanne ionization chambers, by condensing water vapor and counting with a liquid scintillation spectrometer (600 picoCuries/liter sensitivity with a 30-min counting time), or by sorption on silica gel in a portable sampler. Tritium occluded on metals is measured by mass spectrometry or by a bremsstrahlung counter. Exhaust gases are decontaminated by conversion to water vapor and adsorption on silica gel. Waste materials are placed in a burial drum and shipped by government vehicle to an AEC burial ground. Materials containing intermediate quantities (such as molecular-sieve columns) are sealed in 6-inch-diameter aluminum conduit before placing in the drum. Disposal of tritiated water by mixing with dry cement and coating with tar before burial is under study. (Bopp-ORNL)
W73-14978

WATER RESOURCES OF THE USSR. PROBLEMS OF THEIR EFFICIENT USE AND CONSERVATION (VODNYYE RESURSY SSSR. PROBLEMY IKH EFFEKTIVNOGO ISPOL'ZOVANIYA I OKHRANY),
For primary bibliographic entry see Field 06B.
W73-15006

FUNDAMENTAL PROBLEMS OF GROUNDWATER CONSERVATION (OSNOVNYYE PROBLEMY OKHRANY PODZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 05B.
W73-15009

LOUISIANA SUPERPORT STUDIES: REPORT 1, PRELIMINARY RECOMMENDATIONS AND DATA ANALYSIS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 06B.
W73-15018

AN INVENTORY AND ANALYSIS OF EXISTING STORM DRAINAGE SYSTEMS IN THE TOLEDO REGIONAL AREA.
Lucas County Office of the Engineer, Toledo, Ohio.
For primary bibliographic entry see Field 04A.
W73-15021

WATER QUALITY PERCEPTION AND THE RECREATIONAL USES OF GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Green Bay. Regional Analysis Concentration.
R. B. Ditton, and T. L. Goodale.
Water Resources Research, Vol 9, No 3, p 569-579, June, 1973. 3 fig, 5 tab, 14 ref.

Descriptors: *Recreation, Water utilization, Psychological aspects, *Lake Michigan, Regional analysis, *Water quality, *Attitudes, *Wisconsin, Recreation demand.
Identifiers: *Green Bay (Wis).

On the basis of a survey of resident heads of 3,000 households throughout the five Wisconsin counties adjacent to Green Bay, the study identified how people perceived Green Bay as a recreation resource, how these perceptions differed among groups, and how these perceptions related to recreational use patterns. Fishing, swimming, and boating ranked as the most popular activities. Participants in swimming and fishing used inland lakes more frequently than they used the Bay by ratios of 3:1 and 2:1, respectively. For boating, use between inland lakes and the Bay was equally divided. Groups differed significantly in describing the Bay and its most bothersome physical and water quality characteristics. Generally, participants and those who use the Bay were less apt to cite unpleasant smell and dead fish as major problems and more apt to cite such problems as winds, waves, and cloudiness. Comparisons between user groups showed that swimmers and boaters differed most in their perceptions of the Bay, with the former most often citing dirty water and junk on the bottom of the Bay and the latter most often citing winds and weeds. Boaters were most tolerant of unpleasant Bay conditions, swimmers least tolerant, and fishermen between the two positions. This suggests a relationship between the amount of direct water contact of an activity and the tolerance level of the activity participants. (Hoffman-North Carolina)
W73-15024

SHOULD INDUSTRY PURCHASE OR SEEK ITS OWN SUPPLY OF WATER,
New Jersey Dept. of Environmental Protection, Trenton.
For primary bibliographic entry see Field 03E.
W73-15026

CONTROL OF WATER RESOURCES QUALITY: ADMINISTRATIVE ASPECTS,
Thames Conservancy, London (England).
H. Fish.
Effluent and Water Treatment Journal, Vol 13, No 1, p 31-42, January, 1973. 1 fig, 2 ref.

Descriptors: *Legislation, *Administration, *Water quality control, Water pollution, Water resources, Standards, Common law, Legal aspects.
Identifiers: Thames Conservancy (England), Lee Conservancy (England), Water Resources Act 1963 (UK), The Rivers (Prevention of Pollution Act) 1961 (UK), *United Kingdom (England-Wales).

Common law, statute law, and administrative authority dealing with water resource quality in England and Wales are surveyed. A few general principles of riparian rights are stated. The five statutes presently of greatest importance to prevention of water pollution in inland and estuarial waters are identified and discussed: (1) The Salmon and Freshwater Fisheries Act (1923), making it an offense to injure freshwater fish by dumping liquid or solid waste; (2) The Rivers (Prevention of Pollution) Act 1951 provides for maintaining or restoring the wholesomeness of rivers and coastal waters. Several sections of the act applied only to new discharges; (3) The Clean Rivers (Estuaries and Tidal Waters) Act 1960 extends river authority control to specified tidal waters; (4) The Rivers (Prevention of Pollution) Act 1961 brought under administrative control pre-1951 discharges exempted by the Rivers Act of 1951; (5) Sections 72 to 75 of the Water Resources Act 1963 provide a code for control of polluting effluents discharged into underground strata. Authority for administering inland and estuarial pollution control is vested in 27 regional river authorities, although the formation of 10 super-regional water management authorities in April, 1974 is anticipated. (Stein-North Carolina)
W73-15028

SEWERAGE AND SEWAGE DISPOSAL: ADMINISTRATIVE AND TECHNICAL PRINCIPLES,
Thames Conservancy, London (England)
H Fish

Descriptors: *Sewerage, Sewage treatment, Sewage disposal, *Storm runoff, *Storm drains, Tidal water, Legislation, Administration, *Combined sewers, Legal aspects, Water quality control.
Identifiers: *United Kingdom (England-Wales)

Sewerage in its historical, administrative, and legal aspects in England and Wales, and the technology of sewage collection and disposal, with emphasis on storm sewers are described. Earliest sewerage projects served the purpose of public health and attempted to recover manure for fertilizer. Currently 1300 public authorities in England and Wales are responsible for sewerage and sewage disposal. Their primary responsibilities were set in Public Health Acts of 1936 and 1961. Controls over industrial effluents were laid out in Public Health Acts of 1937 and 1961. Sewerage and sewage disposal systems in the United Kingdom fall considerably short of desirable; 30% sewage in 1970 was discharged crude, mainly to tidal waters. The problem of combined sewer systems for normal sewage and storm runoff receives much attention. Some conclusions of the 1970 Reportof the Technical Committee on Storm Overflows and the Disposal of Storm Sewage are: (1) It would be generally undesirable to construct new sewerage systems with storm overflows; (2) separation of storm overflows and surface water would be desirable in urban redevelopment; (3) Use of low side-weir type overflows should be stopped; (4) Discharge of gross solids into sewers may be controlled by use of screens; and (5) Storm overflows should be set according to a formula based on dry weather flow, population and volume of industrial effluent. Determinants of storm sewage flow are cited and methods of sewage disposal are discussed briefly. (Stein-North Carolina)
W73-15029

CONTROL OF WATER RESOURCES QUALITY: SCIENTIFIC AND TECHNICAL ASPECTS,
Thames Conservancy, London (England).
H. Fish.
Effluent and Water Treatment Journal, Vol 13, No 2, p 83-96, February, 1973. 4 tab, 4 ref.

Descriptors: *Water quality control, Shellfish, Airports, Groundwater, Measurement, *Water pollution, *Water quality standards.
Identifiers: Water pollution measurement, *Biotic index.

Basic to management of water resource quality are a clear grant of authority, able staff, adequate information and laboratory facilities. Water quality assessment establishes the present position, determines what controls should be exercised and evaluates the effectiveness of the control applied. The BOD levels, a Trent River Board Biotic Index of 1960, and a 1971 River Pollution Survey river classification scheme are illustrated by tables. The objective of controlling water resource quality is to obtain maximum benefit from that resource in use and environmental value. Controllable factors are discussed generally. Essential quality control measures for a river of normal uses means ensuring (1) that oxygen demand and toxic effects to local outfalls do not become excessive during lowest summer flow, (2) that loadings of non-degradable residuals do not become excessive, and (3) that total loadings of ammonia upstream of each waterworks intake during prolonged cold spells are kept low. Effluent problems of shellfish beds, airport runways, watercress beds, and groundwater are discussed. The nature of unintentional pollutions and how to cope with them by means of practical action such as clearing up of spillages, and restoring fish losses, and by instituting legal proceedings where necessary is discussed. (Stein-North Carolina)

W73-15030

SIMULATION MODEL FOR THE DECISION BETWEEN DILUTION OR SEWAGE TREATMENT DURING DROUGHTS,
Universidade Federal Sao Carlos, Sao Paulo (Brazil). Dept. of Hydraulics.
S. M. Villela.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 523-533, 1973. 1 fig, 3 tab, 10 ref.

Descriptors: *Droughts, *Waste dilution, *Flow augmentation, *Reservoir design, Decision making, Economics, Flow control, Low-flow augmentation, Reservoir releases, Regulation, Water management (Applied), Mathematical models.

One problem which arises when pollution of a basin reaches unacceptable levels is the decision to treat or to dilute sewage. Under regulated conditions size and location of reservoirs could be designed to reach a desired discharge distribution. This would keep the water quality above an adopted standard. Dissolved oxygen and B.O.D. were used as ecological parameters in simulation models for examination of a large number of alternative plans. First the ecological parameters were computed to eliminate plans which are not acceptable. Then, among possible solutions, computations of economics are used for optimization purposes. (Knapp-USGS)
W73-15067

PROHIBITIONS AGAINST WATER POLLUTION.
For primary bibliographic entry see Field 06E.
W73-15144

STATE V. GENERAL MOTORS CORPORATION (PROSECUTION OF CORPORATION FOR VIOLATION OF STATE STATUTE PROSCRIBING POLLUTION OF STATE WATER).
For primary bibliographic entry see Field 06E.
W73-15145

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT BY ESTABLISHING STANDARDS FOR SYNTHETIC DETERGENTS.
For primary bibliographic entry see Field 06E.
W73-15150

WALTON V. ST. CLAIR: THE STANDING QUESTION,
Popham, Haik, Schnobrich, Kaufman and Doty Ltd., Minneapolis, Minn.
For primary bibliographic entry see Field 06E.
W73-15154

QUO WARRANTO TO ENFORCE A CORPORATE DUTY NOT TO POLLUTE THE ENVIRONMENT,
R. Maddigan.
Ecology Law Quarterly, Vol 1, No 3, p 653-671, Summer 1971. 110 ref.

Descriptors: *Industrial pollution, *Legal aspects, *Water pollution control, *Common law, Law enforcement, Jurisdiction, Water quality standards, Governments, Legislation, Water law, Legal review, Judicial decisions, Ecology, Administration.
Identifiers: Writ of quo warranto.

In this comprehensive analysis of the doctrine of quo warranto to enforce a corporate duty not to pollute the environment, the primary argument proposed is that courts can utilize their common law powers over corporate fiduciary duties to create duties of social responsibility and such duties can be enforced through the writ of quo warranto. Since the operation of the capitalist system is based on a preference for the operation of the market rather than comprehensive government regulation and control over the manner of the operation of industry, the quo warranto writ and other result-demanding sanctions maintain an advantage over many of the proposed and existing legislative and administrative solutions. The federal alternative is discussed, since a remedy based on the equity power of fifty different state courts presents a potentially troublesome problem of non-uniformity. A federal solution would not have the uniformity problem as would a state-imposed remedy, but the federal alternative would have the same limitations as any regulatory approach to problems of pollution. (Mockler-Florida)
W73-15155

TAKING VERSUS REASONABLE REGULATION: A REAPPRAISAL IN LIGHT OF REGIONAL PLANNING AND WETLANDS,
For primary bibliographic entry see Field 06E.
W73-15156

LERRO V. THOMAS WYNNE, INC. (ACTION BY PROPERTY OWNERS THROUGH WHOSE PROPERTY CREEK FLOWED AND WHO WERE AFFECTED BY PRESENCE OF FUEL OIL IN THE CREEK).
For primary bibliographic entry see Field 06E.
W73-15157

CONSERVATIONIST'S STANDING TO CHALLENGE THE ACTIONS OF FEDERAL AGENCIES,
For primary bibliographic entry see Field 06E.
W73-15158

DEEP WATER PORT POLICY ISSUES.
For primary bibliographic entry see Field 06E.
W73-15163

NEW COMMITMENT FOR CLEANER WATER,
Senate, Washington, D.C.
J. Randolph.
Water Spectrum, Vol 5, No 2, p 9-13, 1973. 1 illus, 6 photo.

Descriptors: *Water pollution control, Permits, *Legislation, Legal aspects.
Identifiers: Federal Water Pollution Control Act Amendments of 1972.

The Water Pollution Control Act Amendments of 1972 (Amendments) represents the most significant commitment ever made by the federal government to assured supplies of water and to uncontaminated water for our country. The Amendments provide a major redirection of the Nation's program for improved water quality and are a strong assertion by Congress that water quality can no longer be allowed to deteriorate. The stated objective of the law is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters and makes as its goal the elimination of pollutant discharges into navigable waters by 1985, and accepts as an interim goal, the attainment of such water quality by 1983 as is adequate for the protection and propagation of fish, shellfish, wildlife and recreation in the waters. The Act rejects the concept that waters can assimilate substantial quantities of waste without affecting designated beneficial uses and requires that industries comply with permits requiring the installation of the best practicable control technology currently available by 1977. Also discussed are grants to public agencies for construction of sewage treatment works, the activity of the Corps of Engineers, and pollution of the Great Lakes. (Wadley-Florida)
W73-15164

MERCURY POLLUTION AND ENFORCEMENT OF THE REFUSE ACT OF 1899 (PART 3).

Hearings--Subcomm. of the Comm. on Government Operations, U.S. House of Representatives, 92 Cong, 2d Sess, December 1972. 108 p, 6 append.

Descriptors: Water pollution sources, Environmental effects, Water pollution control, *Mercury, *Texas, Industrial wastes, Legal aspects.
Identifiers: *Houston Ship Channel (Tex), *Refuse Act of 1899.

Testimony was taken and materials received for the record dealing with discharges by Armco Steel Corp. into the Houston Ship Channel and events subsequent to a court order enjoining further discharges. The material discharged was held to be highly toxic and to constitute an immediate threat to health, but there was some evidence to suggest that the government, due to some pressure from the White House, had attempted to negotiate a reduction in the standard imposed by the court order. Testimony was taken as to whether such a negotiation took place and if so whether it was proper. (Wadley-Florida)
W73-15167

USING ODOR INTENSITY LIMITS IN AIR QUALITY STANDARDS,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
C. L. Barth.
Paper No. 72-441 presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, 3 tab, 19 ref.

Descriptors: *Air pollution, *Odor, *Regulation, Clean Air Act, *Farm wastes, Livestock, *Measurement, Quality, Feed lots.
Identifiers: Intensity, Primary odor list, Syringe dilution procedure, Osometer.

Because problems with the production and control of animal agricultural odors are sure continue, tighter regulations governing odor intensities will occur. Related difficulties are: (1) Problems in establishing a list of basic odors, (2) difficulty in measuring odor intensities and in making objective odor quality state. Conditions and terminology for odor control need to become more uniform. The status of odor regulations for each state is given. (Dudley-East Central)
W73-15178

PRINCIPLES OF FEEDLOT ODOR CONTROL.
Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 05B.
W73-15181

EFFECTS OF OXYGEN PULPING ON TOXICITY AND COLOUR OF EFFLUENT,
H. E. Worster, and M. F. Pudek.
Pulp and Paper Magazine of Canada, Vol 74, No 3, p 95-98 (Technical Paper T93), March 1973. 11 tab, 6 ref.

Descriptors: Oxygen, *Toxicity, *Pulp wastes, *Bleaching wastes, *Color, Industrial wastes, Pulp and paper industry, Waste water (Pollution), Effluents, Liquid wastes, Water pollution, Air pollution, Bioassay, Foaming, Aeration, Fish, Aquatic animals, Resins, Pollutants.
Identifiers: Oxygen pulping, Oxygen bleaching, Delignification, Pulpwood, White water, Sulfite pulping, Kraft pulping, Linerboards, Paperboards, Sodium sulfite.

Laboratory studies suggested that the pulping of wood with alkali (NaOH) plus oxygen, or pulping

with sodium sulfite followed by delignification (bleaching) with oxygen, should impose lower water and air pollution loads on the environment than conventional kraft (sulfate) digestion. Bioassays showed that white waters from the alkali and oxygen stages, at normal loads of organic matter, are not toxic to fish, and that the white water from sodium sulfite pulp has only one-tenth the toxicity of comparable kraft pulp white water. The soda-oxygen and the sulfite-oxygen white waters also produce less color and foam during aeration than do comparable kraft effluents. Chemical analyses of various white waters indicated that their toxicity to fish increases with increased resin acid contents. Partial delignification of high-yield sodium sulfite pulps with pressurized oxygen also produced linerboard-grade pulps with properties and in yields superior to those of conventional kraft liner pulps. (Brown-IPC)
W73-15188

ON SPENT SEMICHEMICAL PULPING LIQUORS. (I). SPECIES VARIATION OF PULPING TIMBERS COLOR AND CHEMICAL OXYGEN DEMAND, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
For primary bibliographic entry see Field 05B.
W73-15189

COMPREHENSIVE AREA-WIDE WATER AND WASTEWATER FACILITIES PLAN AND PROGRAM FOR THE MID-CUMBERLAND REGION OF TENNESSEE.
Barge, Waggoner, Sumner and Cannon, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 06B.
W73-15196

WATER AND SEWERAGE DEVELOPMENT PLAN, KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City Region, Mo.

(April 1971). 130 p, 19 fig, 26 tab, 16 ref. HUD supported.

Descriptors: *Planning, *Water supply, *Sewerage, Water resources, Water quality control, Water demand, Costs, *Missouri, Evaluation, Human population, Climates, Soils, *Regional development, Cities.
Identifiers: Evaluation criteria, *Kansas City (Mo).

As the basis for implementing the goals of obtaining a comprehensive water system with an adequate supply of desirable quality standards and of obtaining and maintaining efficient sewerage systems, this report consists of three main sections: (1) geography and evaluation criteria for water and sewer planning. The area has three major drainage basins created by the Missouri, Kansas and South Grand Rivers, bottomland soils, terrace or 'high bottom' soils and upland soils, and abundant yearly precipitation. For water planning purposes twice the maximum daily demand is assumed. State standards and policies are to be used as criteria for requiring degree of sewerage treatment. Provisions are to be made for public sanitary sewerage facilities in all future developments with projected urban densities; (2) a complete county-by county analysis of projected water and sewerage facility needs and project priority ratings for each county; and (3) a program for implementation. The success of the regional plan is dependent on cooperation between the counties, municipalities, and utility districts. Consequently, management of water and wastewater facilities should include one or more of the following administrative arrangements: cooperation through intergovernmental agreement; formation of a County Water and/or Sewerage Agency; a Regional or Metropolitan Water and/or Wastewater Management Agency. Comprehensive maps are included that detail water and sewer plans for each county. (Hoffman - North Carolina)
W73-15198

A PLAN FOR WATER AND SEWER, (CHATHAM COUNTY - SAVANNAH).
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.

Report No MPC-SN-114. May 1973. 86 p, 23 fig, 13 tab. GA-04-04-1005.

Descriptors: *Planning, *Water supply, *Sewerage, Financing, Costs, Water quality, Sewers, Urbanization, *Georgia, Utilities, Regional development.
Identifiers: Utility extension, *Savannah (Geo.), *Chatham County (Geo.).

Improvements to be made in water and sewage collection and treatment systems in Savannah-Chatham County Metropolitan Area are recommended for the period 1973 to 1985. Admittedly it is unrealistic to expect all of the recommended sewage systems to be operative by 1985. Estimates are made for the costs of new facilities and annual operations at these horizon years. Water for Chatham County comes from several wells in the Ocala Limestone aquifer west of Savannah. A lowered water table will pose salt-water intrusion problems, within 75 years. Greater dispersion of wells is recommended. Sewer collection is a problem because of flatness and isolation of developable lands by marshes. Treatment is a problem due to isolation of developable land, causing scale diseconomies. Goals related to water and sewer planning include correction of existing problems such as low water pressure, frequent failures in water distribution, and raw sewage discharges, provision of adequate water for fire protection, and elimination of effluent discharges into estuaries and canals in inhabited areas. Projected facility needs are based on population projections. Total consolidation of water and sewer systems into a unified system is not urged, but consolidated operations are, for financial and administrative reasons. Maps of ultimate sewer service areas are featured. (Stein - North Carolina)
W73-15199

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA-ADDENDUM NO 2.
Denver Regional Council of Governments, Colo.

October 1972. 84 p, 5 fig, 1 tab, 2 append.

Descriptors: *Planning, *Design criteria, *Waste water treatment, *Management, *Decision making, *Colorado, Water quality standards, Regional development, Cities, Urbanization.
Identifiers: Waste water systems, Effluent standards, *Denver (Colo).

Current status of the Water Quality Management Program is first summarized. The area is delineated by sanitary sewer treatment areas, which are aggregated into basins and subbasins. Volume, character, and distribution of wastewater is largely determined by land use and population. Projected flows were made on this basis. Environmental, regulatory, and operational planning criteria to be used in the development and evaluation of alternative wastewater systems and in determination of the proposed areawide system are detailed. Water Quality Management Criteria, in terms of regional goals, objectives, planning premises and principles, are also listed. New discharge (effluent) standards, based on specific pollutant quantities rather than percentages of various pollutant factors, are being considered by the Colorado Water Pollution Control Commission. Environmental assessment should be on an areawide basis. Individual facilities impact on the immediately adjacent environment can be judged in terms of their compliance with areawide environmental parameters. Projects are organized by a newly defined set of major basins. The present stage of development for each project is set forth. Additional planning studies recommended are: (1) for mountain areas where effluent from small streams can have a detrimental effect on the quality of water in streams flowing into and through the Denver Metropolitan area; (2) possible storm runoff and snow melt treatment prior to entry into the stream system; (3) evaluation of the impact of industrial discharges on water quality, and (4) analysis of backwash from water treatment. (Hoffman - North Carolina)
W73-15201

MARITIME PROVINCES WATER RESOURCES STUDY, STAGE 1, VOL 1, SUMMARY.
Montreal Engineering Co. Ltd. (Quebec).
For primary bibliographic entry see Field 06D.
W73-15202

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-15256

AN APPARATUS FOR THE REDUCTION OF TRITIUM EMISSIONS INTO THE ATMOSPHERE,
Los Alamos Scientific Lab., N. Mex.
C. M. Dube, D. O. Coffin, and R. D. Stoll.
Available from NTIS, Springfield, Va., as LA-5303-MS; $4.00 in paper copy, $1.45 in microfiche. Report LA-5303-MS, June 1973. 4 p, 7 fig.

Descriptors: *Waste treatment, *Air pollution, *Tritium, *Nuclear wastes, Absorption, Instrumentation, Moisture uptake, Automatic control, Public health.

Conversion of tritium to tritiated water vapor and absorption on molecular sieve reduced the tritium content more than 250,000-fold for gaseous effluents containing 0.5% tritium. Gas to be treated was pumped into a holding tank at about 15 psig. An automatic programmer regulated the treatment. As a safety feature the system is designed to shut down in the event of power failure. (Bopp-ORNL)
W73-15257

WATER POLLUTION CONTROL IN ASIA AND THE FAR EAST.
Economic Commission for Asia and the Far East (UN), New York.

Water Resources Journal, United Nations Economic Commission for Asia and the Far East (ECAFE), p 29-57, December 1972. 5 fig, 5 tab.

Descriptors: *Water pollution control, *Asia, Legal aspects, Social aspects, Economics, Planning, Water management (Applied), Water pollution sources, Water quality.
Identifiers: *Developing countries.

Water pollution control in some of the developing countries in Asia and the Far East has not received sufficient attention because of higher priorities being assigned to the attainment of self-sufficiency in the production of food grains and the provision of basic necessities of living for the population. The extent of pollution varies from moderate to serious proportions. In a number of countries, even where pollution as a whole is insignificant, there are areas where water pollution is a serious problem owing to the concentration of industry

and population. A broad technological and socioeconomic approach to pollution abatement is fundamental and can be applied in any country in the world, with due allowance being made for local conditions in arriving at final measures. (Knapp-USGS)
W73-15271

A SURVEY OF LONG-TERM WATER REQUIREMENTS IN JAPAN.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 06D.
W73-15272

PRELIMINARY DATA ON BIOLOGY AND SPECIFICITY OF ACIGONA IGNITALIS HAMPS. (LEP., PYRALIDAE) ON THE HOST PLANT EICHHORNIA CRASSIPES (MART.) SOLMS LAUBACH (PONTEDERIACEAE), (IN SPANISH),
Escuela Agricola Jackson, Montevideo (Uruguay). Dept. of Entomology.
A. Silveira-Guido.
Rev Soc Entomol Argent. Vol 33, No 1-4, p 137-145, 1971, Illus, (English summary).
Identifiers: *Acigona-Ignitalis, Biological, Biology, Control, Eichhornia-Crassipes, Host, Lepidoptera, Plant, *Pontederiaceae, *Pyralidae, Specificity, Weed, *Water hyacinth.

The water hyacinth E. crassipes, a serious aquatic pest spreads rapidly wherever it establishes outside its natural area. A. ignitalis, a multivoltine insect, lays eggs normally on the leaves. Upon hatching the young larva penetrates the leaf or petiole and eats the plant tissues. Pupation takes place inside the petiole, very rarely in other spaces. Tests on host specificity were done on 14 plant species and the feeding activity compared with water hyacinth. Because A. ignitalis lived only in an aquatic environment, the behavior pattern will probably not change. On the basis of host specificity, it could be used for biological control of weeds.--Copyright 1973, Biological Abstracts, Inc.
W73-15286

SUCCESSIONS OF PLANKTONIC ORGANISMS IN GROUND WATER RECHARGE BASINS FED BY RIVER WATER,
M. Noll.
Arch Hydrobiol. Vol 70, No 3, p 355-378, 1972, Illus, (English summary).
Identifiers: Basins, *Germany (Rhine region), Organisms, *Planktonic populations, *Recharge basins, Rivers, Successions, Water purification, *Self purification.

Stages of purification of Rhine water in tanks linked in series are described. Many species come in with the river water. At a certain distance from the inlet, a mass development of organisms takes place in the longest basin. Further on there is a decline. The basin farthest from the inlet is characterized by a variety of organisms which are not found in the Rhine, West Germany. By considering the whole complex, it can be shown that, depending on the distance and velocity of the water, a biological self-purification takes place which manifests itself in its chemical composition as well as in its organisms populations.--Copyright 1973, Biological Abstracts, Inc.
W73-15290

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

MATHEMATICAL MODELING OF URBAN WATER MANAGEMENT STRATEGIES,
Colorada State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 06B.
W73-14757

DIRECTORY OF WATER RESOURCES RESEARCH FACULTY AT UNIVERSITY OF MINNESOTA AND STATE AND PRIVATE COLLEGES IN MINNESOTA,
Minnesota Univ., St. Paul. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service as PB-223 872, $4.75 in paper copy, $1.45 in microfiche. Bulletin 64 1973. 46 p. OWRR A-028-MINN (1). 14-31-0001-4023.

Descriptors: Water resources, *Research, *Biographies, *Minnesota, *Universities, Colleges, Education, Training, *Scientific personnel, Manpower.
Identifiers: *Directory.

This directory provides a listing of University of Minnesota and State and Private Colleges in Minnesota faculty having specialized training and research experinece in fields directly related to water resources. In May 1973, 194 faculty members were requested to submit a short biographical sketch to the Water Resources Research Center for use in preparing this directory. Information received from 74 faculty is included in this directory. Faculty who did not submit biographical sketches are listed with names, affiliations and addresses. The directory consists of an alphabetized list of the faculty members, their departments, education, and experience. No attempt has been made, however, to be complete in listing publications, research, or other information. A keyword index has been provided to assist in locating faculty having particular specialties. There are faculty members with training and experience in all of the various fields directly related to water resources. Biologists are particularly numerous followed by Chemists, Geographers, Agricultural Engineers and Soil Scientists, Ecologists, Sociologists, Public Administration and Political Scientists, and Economists. There are few Lawyers, Sanitary Engineers, Limnologists, Hydrologists, Hydraulic Engineers, Hydrogeologists, Forest Hydrologists, Climatologists, and Recreation Scientists.
W73-14862

PLANNING THE DEVELOPMENT OF THE NESTOS RIVER,
COBA-Consulpresa, Lisbon (Portugal).
For primary bibliographic entry see Field 04A.
W73-14907

WATER PLANNING MODELS IN NORTH ATLANTIC STUDY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W73-14908

MULTILAKE RIVER SYSTEM OPERATION RULES,
New York State Dept. of Environmental Conservation, Albany. Water Management Planning.
For primary bibliographic entry see Field 04A.
W73-14909

SIMULATION IN WATERSHED PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 04A.
W73-14910

LEAST-COST DESIGN OF WATER DISTRIBUTION SYSTEMS,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-14911

OPTIMAL SEQUENCING OF CAPACITY EXPANSION PROJECTS,
Northwestern Univ., Evanston, Ill. Urban Systems Engineering Center.
T. L. Morin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Proceedings paper No 9972, p 1605-1622, September 1973. 2 fig, 4 tab, 42 ref, 3 append.

Descriptors: Water resources, *Planning, *Dynamic programming, Hydraulics, *Multiple-purpose projects, Scheduling, Timing, *Optimization, *Algorithms, Mathematical models, Systems analysis, Computer programs, Reservoirs, River basins.
Identifiers: *Capacity expansion, Economic analysis, *Sequencing, Cost minimization, Permutations, Sensitivity analysis.

A multidimensional sequencing problem frequently found in the planning of capacity expansion in large-scale water resources system is solved using a dynamic programming algorithm. The algorithm utilizes the imbedded state space concept in order to effect a reduction of dimensionality making it possible to efficiently solve problems of the dimension encountered in real-world water resource systems. Specifically, the sequencing problem involves the determination of the minimum discountered cost sequence for the construction of a set of high cost multiple-purpose water resources projects, which in aggregate, must supply a number of time-varying, water-related, demand requirements over a specified planning horizon. Computational experience with the imbedded state space dynamic programming algorithm on the solution of a number of two- and three-dimensional sequencing problems from several real-world water resources systems is reported. The results of a sensitivity analysis on these data are also presented. (Bell-Cornell)
W73-14912

SIMULATION AND OPTIMIZATION OF ACID MINE DRAINAGE ABATEMENT ALTERNATIVES,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 05G.
W73-14913

EVALUATING FEDERAL WATER PROJECTS: A CRITIQUE OF PROPOSED STANDARDS,
Wisconsin Univ., Madison.
C. J. Cicchetti, R. K. Davis, S. H. Hanke, and R. H. Haveman.
Science, Vol 181, No 4101, p 723-728, Aug 24, 1973. 22 ref.

Descriptors: *Evaluation, *Standards, *Water quality standards, *Project planning, *United States, *Federal government cost-benefit analysis, Land resources, Planning, Costs, Ecology, Interest rates, Cost sharing, Pricing, Economics, Resources development, Natural resources, Regional development.
Identifiers: *Water Resources Council.

The 'Principles and Standards for Planning Water and Related Land Resources' proposed by the Water Resources Council (WRC) (Federal Re-

gister, Vol 36, No 245, Part II, p 24144) are criticized as encouraging inefficient projects and neglecting harmful environmental impacts. The prescription of benefit estimation techniques is deemed inadequate and said to ignore certain significant opportunity costs, especially those related to the delcterious ecological effects attributable to a project. The explicit judgments made in the 'Principles and Standards' adjust economic parameters in the direction of inefficient choices, e.g., unjustifiably low interest rates. Implicit judgments necessary for implementing regional developments, as well as equity accounts are left to agency planning without adequate guidelines. By not considering cost-sharing and pricing policies as integral parts of the evaluation process, the 'Principles and Standards' are not likely to encourage efficient and equitable programs. The cumulative effect of the above deficiences is claimed to bias public decisions toward excessively large water and land resource development programs. (Brown-IPC)
W73-14926

FLOOD CONTROL POLICIES DEVELOPED BY SIMULATION,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 04A.
W73-15047

6B. Evaluation Process

MATHEMATICAL MODELING OF URBAN WATER MANAGEMENT STRATEGIES,
Colorada State Univ., Fort Collins. Dept. of Agricultural Engineering.
W. R. Walker.
Available from the National Technical Information Service as PB-223 895, $5.50 in paper copy, $1.45 in microfiche. Ph.D. Dissertation, August 1973. 191 p, 43 fig, 4 tab, 57 ref, 2 append. OWRR B-071-COLO (5).

Descriptors: *Institutional constraints, *Mathematical models, *Optimization, Systems analysis, *Urbanization, Waste water treatment, *Water management (Applied), Water quality, *Water supply, Algorithm, *Colorado, Water reuse, Recycling, Water rights, Inter-basin transfers, Decision making, Alternative planning.
Identifiers: *Denver (Colo).

The rapid expansion of many western urban centers has nearly outstripped available stream flow and groundwater resources requiring municipal water departments to initiate exhaustive searches for new water supplies. Among the most feasible alternatives being investigated to date are acquisition and transfer of agricultural rights, interbasin water diversions, and wastewater recycling. A management level urban water system model has been formulated in which a system analysis format is employed to answer some of the basic questions concerning the optimal combination of these alternative supplies. The model incorporates a nonlinear differential optimization algorithm to coordinate urban water supply, distribution, and wastewater management. A test of the model's utility is made in an application to the water management problems of the Denver, Colorado metropolitan area. Denver has utilized both agricultural transfers and transmountain diversions to supplement the natural stream resources of the South Platte River. Plans are being made to increase the capacity of these sources, increasingly stringent standards on the area's effluents are enhancing the feasibility of reclaiming and recycling a portion of the wastewater. The urban model used in this study indicates the decision points at which respective strategies are introduced. By formulating the model from a planner's viewpoint, the most important results gained from the analysis are the costs of various institutional constraints which may restrict the decision makers' ability to implement optimal policies.
W73-14757

MARGINAL VALUES OF WATER USED IN THE IRRIGATION OF CITRUS IN THE CENTRAL RIDGE SECTION OF FLORIDA,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 03F.
W73-14760

RIVER BASIN SIMULATION AS A MEANS OF DETERMINING OPERATING POLICY FOR A WATER CONTROL SYSTEM,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
C. F. Kiker.
Available from the National Technical Information Service as PB-223 961, $8.25 in paper copy, $1.45 in microfiche. PhD Dissertation, 1973. 108 p, 23 fig, 17 tab, 23 ref. OWRR B-007-FLA (7). 14-31-0001-3267.

Descriptors: *Water allocation (Policy), Water values, Water utilization, Water demand, Decision making, *Water control, *Water policy, *Florida, Flood control, *Model studies, Institutional constraints, River basin development, Water storage, Management, Regions.
Identifiers: *Upper Kissimmee River basin (Fla).

This study suggests simulation as a means of considering alternative policies for an existing water control system. Specifically, the problem of dealing with the formulation of water management policy for the area of south Florida within the Central and Southern Florida Flood Control District was undertaken. The objectives were to (a) propose an organizational framework in which hydrologic, economic, and institutional aspects of the region may be used in policy development, (b) develop a simulation model which includes the salient hydrologic, economic, and institutional features of the Upper Kissimmee River Basin to serve as a guide, (c) demonstrate the usefulness of the simulation model in policy evaluations, and (d) determine the appropriateness of the approach for use in policy problems encountered when dealing with a large region. A first-generation simulation model of the hydrologic phenomena and water-oriented activities in the Upper Kissimmee River Basin was developed. Models of the surface water management system, the water use activities, and the institutional constraints were interfaced with rainfall and watershed runoff models. The model of the surface water management system included submodels of the gate-type control structures, the canal systems, and the water storage system. The water use activities model was made up of submodels for crop irrigation, residential water consumption, and property flooding. The institutional constraint model included sub-models of lake surface elevation, consumptive withdrawal, and minimum flow regulations. (Morgan-Florida)
W73-14761

THE EFFECTS OF DIMINISHED GROUNDWATER SUPPLIES ON SELECTED NEW HAMPSHIRE INDUSTRIES,
New Hampshire Univ., Durham. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 04B.
W73-14766

THE FORMULATION OF AN OUTDOOR RECREATION SUPPLY FUNCTION,
Cornell Univ., Ithaca, N.Y.
E. Dersch.
Available from the National Technical Information Service as PB-223 929, $5.50 in paper copy, $1.45 in microfiche. New York Resources and Marine Sciences Center, and Cornell University Agricultural Experiment Station, Technical Report No 65 1973 200 p, 9 fig, 10 plates, 18 tab, 179 ref, 7 append OWRR B-002-NY (7) 14-01-0001-823.

Descriptors. *Reservoirs, *Recreation, *Regional analysis, Resource allocation, Natural resources, *New York, Decision making, Optimal development plans, Land use, Water utilization
Identifiers *Whitney Point (N.Y.), *Recreation supply function.

A recreation supply function, a tool to assist planners in making long term decisions is formulated Using this tool the capacity of a natural resource to support a range of recreational activities is determined and an optimal development strategy for the area is devised The case study was done on the Whitney Point Reservoir Area in Broome County, New York. The recreation resource base, recreation standards, natural features and the recreation use capacities of this area were investigated. (See also W70-07545 (Irwin-New York)
W73-14768

A COMPUTER-IMPLEMENTED INSTRUCTIONAL GAME FOR EVALUATING WATER MANAGEMENT ALTERNATIVES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
R. T. Lackey.
Available from the National Technical Information Service as PB-223 966, $7.75 in paper copy, $1.45 in microfiche. Virginia Water Resources Research Center Completion Report, July 1973, 112 p, 1 fig, 1 tab, 8 ref. OWRR A-049-VA (1).

Descriptors: *Education, *Multiple-purpose reservoirs, Training, Lakes, Reservoirs, Impoundments, Model studies, *Computer models, Fisheries, Wildlife, Recreation, Hydroelectric power, Water management (Applied), *Virginia.
Identifiers: *Smith Mountain Lake (Va), Roanoke River (Va).

Computer-implemented learning exercises involving large system management should become an important natural resource educational tool. One such teaching game, DAM, illustrates the principles of managing a large multiple-use reservoir system. Stages in the development of DAM were: (1) model conceptualization, (2) model quantification and implementation, and (3) model refinement. The finished product is based on the use of economic and quantity numerical accumulators and a random number generating function. Management realism and role switching enhance DAM's value as a tool for acquainting students with management based on total system understanding.
W73-14772

PUBLIC INVESTMENT CRITERIA FOR WATER ORIENTED RECREATION IN THE LAKE ERIE BASIN,
Ohio State Univ., Columbus. Dept. of Economics.
For primary bibliographic entry see Field 06D.
W73-14774

THE VALUE OF RESERVOIR RECREATION,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
J. Romm.
Available from the National Technical Information Service as PB-223 971, $4.25 in paper copy, $1.45 in microfiche. Partial Completion Report, New York Water Resources and Marine Sciences Center, Ithaca and Cornell University Agricultural Experiment Station, Technical Report No. 19, A. E. Res. 296, August, 1969, 102 p, 19 graphs, 24 tab, 15 ref, 1 append. OWRR B-002-NY (6).

Descriptors: Reservoirs, *Recreation, *Value, *Benefits, *Recreation demand, Surveys, Evaluation, Resource allocation, Decision making, Alternative planning, *New York, Investment, Market value, Political aspects, Social aspects, Systems analysis, Model studies.
Identifiers: *Public resources, Public objectives, Benefit estimation, *Whitney Point Reservoir (NY), Broome County (NY).

The purpose of recreation benefit estimation is to facilitate comparisons between recreation and alternative public investiment opportunities. It provides a means to answering the important question of how scarce public resources should be alloted to activities for which there is no market indicator of value. Some methods of recreation benefit estimation are compared. Stressed are the relative advantages and limitations of the different techniques; an attempt is made to place them in a perspective that increases their utility in decision-making processes. Comparisons are based upon data collected in a survey of recreationists at Whitney Point Reservoir, Broome County, New York, during the summer of 1966. Recreation development in this area has required a significant expenditure of public resources, as well as sacrifice in the flood control capability of a dam. These development costs, justified with little idea of benefits that would result, are an example of the need for improving techniques of recreation benefit estimation. It is concluded that benefit estimation methods differ in sensitivities to environmental and social forces, and in definitions of what is appropriately measured; future research should seek to clarify difference, to explore for the real meanings of different valuation methods - which methods apply to which public objectives. (Bell-Cornell)
W73-14775

WATER RESOURCES AND UTILIZATION (VODA--RESURSY I POTREBLENIYE),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. N. Voznesenskiy.
Vodnyye Resursy, No 1, p 3-14, 1972.

Descriptors: *Water resources, *Water utilization, Irrigation programs, Hydroelectric plants, Fishing, Water management (Applied), Runoff, Water supply, Water quality control, Economics, *Forecasting, *Optimal development plans, Water distribution (Applied).
Identifiers: *USSR.

Characteristics and distribution of water resources in the USSR and long-range forecast of their complex use are discussed. Regional water-management problems and redistribution of runoff in time and area are considered, and the importance of water quality control is noted. Basic trends of scientific investigations on optimal water use are outlined, and the need for a complex approach to the study of water problems is stressed. (Josefson-USGS)
W73-14846

PROBLEMS OF RESERVOIR CONSTRUCTION AND COMPLEX USE IN THE USSR (PROBLEMY SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA VODOKHRANILISHCH V SSSR),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 08A.
W73-14851

THE ARAL SEA PROBLEM (PROBLEMA ARAL'SKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 04A.
W73-14852

SOCIAL/ENVIRONMENTAL SYSTEMS FOR REGIONAL DEVELOPMENT PLANNING,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
W. R. Maki.
Available from the National Technical Information Service as PB-223 931, $3.75 in paper copy, $1.45 in microfiche. University of Minnesota, Water Resources Research Center Mimeographed Report 1973. 29 p, 1 fig, 1 tab, 43 ref. OWRR B-044-MINN (2). 14-31-0001-3293.

Descriptors: *Regional development, Resources, Water resources, Minnesota, Planning, Investment, *Input-output analysis, Model studies, Regional analysis, *Resource allocation, Water users, Computer models.
Identifiers: Producer, Provider system, Service delivery sub-model, Consumer, User system, Social, Environmental service delivery, *Upper midwest region, Capital improvements.

Information needs for implementing public programs of resource use and control are discussed. Economic models for producing the needed data are presented as activity components of an extensive computer modeling capability. The activity components are building blocks in the construction of a workable system for relating research findings to management and policy questions in regional development. A series of activity components are presented as elements of a regional system; these elements are identified as follows: population, demand, output and employment, earnings and income, capital improvements and financing, facility location, land use, environmental management, public financing and public policy. (Walton-Minnesota)
W73-14860

FINANCING ALTERNATIVES FOR REGIONAL RESOURCE DEVELOPMENT,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
W. R. Maki.
Available from the National Technical Information Service as PB-223 913, $2.75 in paper copy, $1.45 in microfiche. University of Minnesota, Water Resources Research Center Mimeographed Report, April 14, 1973. 16 p, 1 fig, 6 tab, 20 ref. OWRR B-044-MINN (1). 14-31-0001-3293.

Descriptors: *Resources development, *Financing, *Minnesota, Water resources, Planning, *Regional development, *Project planning, *Investment, Community development.
Identifiers: *Area development accounts, Capital improvements.

To help in developing and testing alternative approaches to resource development, a multi-county study area was selected in West Minnesota. This area is part of a hierarchy of development planning regions and subregions which make up the Upper Midwest Region. Financing gaps exist, not only for municipal water and sewer facilties construction, but also for capital improvements in areawide environmental management and multi-area basinwide resource development. Area capital improvements budgets are needed for each government function which include a listing of high priority projects for attaining area and community goals. The first task in assessing financing alternatives was therefore, the preparation of a set of area development accounts. The area development accounts were transformed into area development issues by a series of maps which show the time scheduling and the place location of proposed development projects. The project sponsors and others affected by proposed program of capital improvements are able to identify the specific time and place in which their interests are endangered, or reinforced, by the proposed development program. Financing alternatives for area resource development also were provided in the area development accounts. These alternatives would include a combination of federal, state and local income sources and financing arrangements. Each government level, however, would excercise a particular bias in assessing the costs and benefits of alternate financing arrangements. (Walton-Minnesota)
W73-14861

ECONOMIC MODELS OF INDUSTRIAL POLLUTION CONTROL IN REGIONAL PLANNING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-14904

WATER RESOURCES OF THE USSR. PROBLEMS OF THEIR EFFICIENT USE AND CONSERVATION (VODNYYE RESURSY SSSR. PROBLEMY IKH EFFEKTIVNOGO ISPOL'ZOVANIYA I OKHRANY),
Ye. Ye. Alekseyevskiy.
Vodnyye Resursy, No 2, p 7-24, 1972. 2 tab.

Descriptors: *Water resources, *Water utilization, *Water conservation, Water management (Applied), Water supply, Water pollution, Water quality, Water users, Agriculture, Land reclamation, Irrigation, Drainage, Irrigation water, Freshwater, Economic efficiency, Legislation.
Identifiers: USSR.

One of the major water users in the Soviet national economy is agriculture. A major problem in agriculture is that of increasing economic efficiency of land reclamation through creation of large farms on irrigated lands and of optimally combining all factors involved in intensification of agricultural production (mechanization, introduction of chemical processes, selective breeding, etc). Basic problems in the conservation and rational use of water resources, including ways of increasing productive use of irrigation water, are discussed, and special attention is paid to major trends in scientific investigations tending to promote scientific and technical progress in the field of water management. A brief account is given of freshwater resources in the USSR and of their present and future use. (Josefson-USGS)
W73-15006

LOUISIANA SUPERPORT STUDIES: REPORT 1, PRELIMINARY RECOMMENDATIONS AND DATA ANALYSIS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
J. H. Stone, M. J. Hershman, D. B. Johnson, S. M. Gagliano, and C. A. Whitehurst.
Publication LSU-SG-72-03, August, 1972. 419 p, 42 fig, 19 tab, 61 ref, append. $5.00. NOAA Office of Sea Grant 2-35231.

Descriptors: *Regional economics, *Superports, *Deep water ports, Supership.

United States, lacking deep draft ports that can accommodate vessels of more than 80,000 dead weight tons, is presently unable to take advantage of the economies of scale provided by the growing number of supership. The decision to develop a superport (deep water port) in Louisiana is necessarily influenced by legal, environmental, and engineering aspects as well as economic considerations. The first chapter summarizes preliminary recommendations. State control is seen as essential for ensuring appropriate plans and objectives. The remaining chapters detail such topics as the interface between local/state/federal interests in the superport; responsibilities for supportive services, including transportation/utility links; taxation questions; pertinent legal statutes, data on superships and superports; recent economic and political trends affecting superport development and utilization; petroleum and crude flows within and among Petroleum Administration Districts;

commodity flows data, both export and import, for the Central Gulf region; probable natural, cultural, and social stresses, constraints, and opportunities resulting from a superport; alternative forms of superport structure; and a model of how the superport will affect product distribution to modes of transportation and how this distribution will affect transportation modes operating long the Mississippi River. (See also W73-14592) (Hoffman-North Carolina)
W73-15018

WATER QUALITY PERCEPTION AND THE RECREATIONAL USES OF GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Green Bay. Regional Analysis Concentration.
For primary bibliographic entry see Field 05G.
W73-15024

SHOULD INDUSTRY PURCHASE OR SEEK ITS OWN SUPPLY OF WATER,
New Jersey Dept. of Environmental Protection, Trenton.
For primary bibliographic entry see Field 03E.
W73-15026

ANALYSIS OF RISKS AND UNCERTAINTIES IN FLOOD CONTROL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-15056

USE OF REGIONAL ECONOMIC MODELS IN THE EVALUATION OF DROUGHT IMPACT,
Colorado State Univ., Fort Collins.
J. Millan.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 534-550, 1973. 2 fig, 2 tab, 11 ref.

Descriptors: *Droughts, *Mathematical models, Economics, *Economic impact, Dynamic programming, Water shortage, Monte Carlo method, Hydrologic data, *Regional analysis.

A comprehensive model determines the total impact of drought on a region's economy. The model accounts for the direct and indirect effect of droughts in both space and time. A programming formulation of the dynamic type simulates the regional economy over a selected time horizon in order to allocate the drought shortages and compute its losses following a consistent procedure. The Monte Carlo method of generating large numbers of hydrologic samples is used with the model of the regional economy to make probabilistic statements about the different impacts of droughts. (Knapp-USGS)
W73-15068

REGIONAL WATER EXCHANGE SYSTEM AS AN ALTERNATIVE FOR ALLEVIATING DROUGHT PROBLEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Takeuchi.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 561-573, 1973. 1 fig, 3 tab, 3 ref. NSF Grant GK-11564.

Descriptors: *Water management (Applied), *Water transfer, *Droughts, Water shortage, Water supply, Reservoir design, Reservoir operation, Inter-basin transfers, *Regional analysis.

Construction of large reservoirs to alleviate drought problems is a growing source of sociopolitical, economic, and ecological problems in the affected regions, as well as in the areas to be inundated. Regional water exchange systems are proposed as an effective alternative to or as a supplement to large water regulation reservoirs. To quantify the effect of water exchange systems, the reduction ratio is introduced. Conceptualization of regional water exchange systems, theoretical introduction to the proposed indicator, and an example of application of the indicator to the six major subregions in the Central West of the United States are discussed. (Knapp-USGS)
W73-15070

COMPREHENSIVE AREA-WIDE WATER AND WASTEWATER FACILITIES PLAN AND PROGRAM FOR THE MID-CUMBERLAND REGION OF TENNESSEE.
Barge, Waggoner, Sumner and Cannon, Inc., Nashville, Tenn.

Prepared for Mid-Cumberland Council of Governments and Mid-Cumberland Development District, June 1973. 93 p, 4 fig, 2 tab, 3 append. CPA-TN-33-1002-3082. CPA-TN-33-1002.

Descriptors: *Water supply, *Sewerage, Coordination, Waste water disposal, *Tennessee, Costs, Water quality, Land use, Planning, Waste water treatment, *Treatment facilities, *Comprehensive planning.
Identifiers: Mid-Cumberland Region (Tenn), *Cumberland River (Tenn), Utility extension, Nashville (Tenn).

A comprehensive area-wide water and wastewater facilities plan based on previous economic, population and land use forecasts is presented. The Mid-Cumberland Region is on the threshold of a period of sustained growth. Utility needs over the next 5 to 10 and 20 to 30 years are identified and related to over all planning objectives and criteria for guiding growth and development established by the Mid-Cumberland Council of Governments and Development District. Types, locations and extent of water intake and treatment plants, storage and distribution facilities as well as wastewater treatment plants, sewers and force mains to be added or modified are discussed on a county-by-county basis. Extensive public water supply systems rely increasingly on surface streams as sources. Reduction of 68 distribution systems to 23 systems is recommended. Cumberland River and its tributaries will continue to serve as primary waste disposal sites for the region. Comparatively few wastewater systems exist. Lack of uniform construction standards has led to undersized lines and storage facilities inadequate for future needs. A program for coordinated operation and maintenance of area-wide water and wastewater systems is suggested. It is proposed that a regular department or agency of county government be responsible for planning, financing, constructing, operating and maintaining the water and wastewater facilities in each county outside municipal service areas. Legislation by the Tennessee General Assembly may be necessary. (Edwards - North Carolina)
W73-15196

WATER AND SEWERAGE DEVELOPMENT PLAN, KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City Region, Mo.
For primary bibliographic entry see Field 05G.
W73-15198

A PLAN FOR WATER AND SEWER, (CHATHAM COUNTY - SAVANNAH).
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.
For primary bibliographic entry see Field 05G.
W73-15199

MUNICIPAL SEWAGE TREATMENT SYSTEMS--INVENTORY OF THE STRUCTURE AND FUNCTIONS OF RHODE ISLAND'S PUBLIC SEWAGE TREATMENT SYSTEMS.
Rhode Island Water Resources Board, Providence
For primary bibliographic entry see Field 05D
W73-15200

INTERIM PLAN FOR WATER QUALITY MANAGEMENT IN THE DENVER METROPOLITAN AREA-ADDENDUM NO 2.
Denver Regional Council of Governments, Colo
For primary bibliographic entry see Field 05G
W73-15201

THE GREAT LAKES BASIN: ALTERNATIVE INSTITUTIONAL ARRANGEMENTS FOR MULTI-PURPOSE RESOURCES MANAGEMENT,
Guelph Univ. (Ontario). Centre for Resources Development.
For primary bibliographic entry see Field 06E.
W73-15203

PARTICIPATION AND EXPENDITURES FOR HUNTING, FISHING AND GENERAL RURAL OUTDOOR RECREATION IN ARIZONA,
Arizona Univ., Tucson.
R. L. Gum, W. E. Martin, A. H. Smith, and C. D. Depping.
Arizona Agricultural Experiment Station, Research Report 270. August 1973. 27 p, 11 illus, 37 tab.

Descriptors: *Hunting, *Fishing, *Recreation, *Wildlife, *Social participation, Big game, Small game, Waterflow, Attitudes, Economics, Motivation, Multiple-purpose projects, Natural resources, Psychological aspects, Recreation demand, *Arizona, Surveys, Warm-water fishing, Cold-water fishing, Economic impact, Expenditures.

A fourth survey of hunting and fishing, covering the year 1970, was conducted to determine the total economic value of benefits assignable to fish and wildlife in Arizona, and to ascertain the participation and expenditures of sportsmen, emphasizing household participation and expenditure, rather than man-trips and man-days. A study of the recreation activities of households allowed for expansion of the number of rural outdoor recreational activities which could be researched. Statistical data on types of hunting and fishing by resident and nonresident, including comparisons between 1965 expenditures and 1970 expenditures, are given. Socioeconomic characteristics and attitudes of households delineate a composite picture of sportsmen, with a majority of them being in the 35-54 year age bracket, for both resident and nonresident, with sportsmen in the older age brackets representing a larger portion of the total than they did in 1965. Educational levels, occupations, incomes, size of place of residence, percentage of household trips with more than one household participating, and attitudes about hunting and fishing of both nonresident and resident sportsmen and nonsportsmen are included. (Bahre-Ariz.)
W73-15225

A NATIONAL WATER GRID FOR INDIA.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 04A.
W73-15270

A SURVEY OF LONG-TERM WATER REQUIREMENTS IN JAPAN.
Economic Commission for Asia and the Far East (UN), New York.

For primary bibliographic entry see Field 06D.
W73-15272

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FINANCING ALTERNATIVES FOR REGIONAL RESOURCE DEVELOPMENT,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 06B.
W73-14861

A GENERAL PERSPECTIVE CONCERNING THE COST OF POLLUTION ABATEMENT AT ANY SPECIFIED LEVEL,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-14921

PRIORITY RANKING OF FUTURE FLOOD CONTROL INVESTMENTS,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 06D.
W73-15045

INTERREGIONAL COMPETITION IN THE CATTLE FEEDING ECONOMY, WITH SPECIAL EMPHASIS ON ECONOMIES OF SIZE,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 03F.
W73-15184

AN ECONOMIC COMPARISON OF SHORT AND FULL SEASON COTTON PRODUCTION IN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-15217

6D. Water Demand

THE FORMULATION OF AN OUTDOOR RECREATION SUPPLY FUNCTION,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 06B.
W73-14768

PUBLIC INVESTMENT CRITERIA FOR WATER ORIENTED RECREATION IN THE LAKE ERIE BASIN,
Ohio State Univ., Columbus. Dept. of Economics.
R. A. Tybout.
Available from the National Technical Information Service as PB-223 912, $2.75 in paper copy, $1.45 in microfiche. Ohio Water Resources Center, Columbus, Project Completion Report No. 346X, December 1972. 7 p. OWRR A-009-OHIO (1). 14-01-0001-1403.

Descriptors: *Recreation demand, *Investment, Water pollution, Economic prediction, Measurement, Water sports, Regression analysis, *Lake Erie, Resource allocation, *Water allocation (Policy), *Income analysis, Pollution taxes (Charges).
Identifiers: Negative externalities, Demand analysis, Economic criteria, *Coase theorem.

The research results of an attempt to correct several basic flaws in the economic theory relevant to pricing pollution and other negative externalities are presented. Specifically, the validity of the Cease Theorem concerning the ownership of a polluting factor and its effect on the allocation of resources is ciriticized. It is noted that property rights should not be associated with pollution factors, but rather pollution output; and the two profit concepts of total and marginal profits are reconciled for the case of internalization by compensation. Comprehensive measurement of the demand for water-based recreation is discussed. It is suggested that such a measure must relate to the quantity of recreation consumed. Three important effects which must be reflected in shift parameters were noted: long term changes in income levels, natural site quality, and congestion. A theoretical model for shift analysis within an econometric framework was developed. (Weaver-Wisconsin)
W73-14774

THE VALUE OF RESERVOIR RECREATION,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W73-14775

WATER PLANNING MODELS IN NORTH ATLANTIC STUDY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. C. Major.
Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 99, No UP2, Proceedings paper No. 9996, p 131-136, September 1973. 1 fig, 9 ref.

Descriptors: *Water resources, *Comprehensive planning, *Water supply, *Mathematical models, Water demand, Water flow, Municipal water, Constraints, Regional analysis, Input-output analysis, Systems analysis, Optimization.
Identifiers: *Urban planning, *Economic analysis, Cost minimization.

Large-scale computerized water flow demand and supply models for the North Atlantic Regional Water Resources Study are described together with their use in the planning process. The demand model is a requirement projection model based on a regionalized input-output table, a regression projection equation, and water use coefficients. The supply model is a mathematical programming model that minimizes costs of supply subject to constraints. The models were used in a multiobjective planning context in which efforts were made to incorporate model results into the planning process. Use of the models in this context had positive effects on the planning process. (Bell-Cornell)
W73-14908

APPRAISAL OF THE WATER RESOURCES OF CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-14996

WATER RESOURCES OF THE DELMARVA PENINSULA, A SUMMARY REPORT TO THE CONGRESS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W73-15000

UTILITY DISTRICT ANTICIPATES FUTURE WATER NEEDS,
East Bay Municipal Utility District, Oakland, Calif.
J. S. Harnett.
Public Works, Vol 104, No 7, p 64-67, July, 1973. 2 fig, 5 photos.

Descriptors: *Water supply development, *Watershed management, Dependable supply, *Reclaimed water, Desalination process, *Water demand, *Water conservation, *California, Projections, Human population, Urbanization.
Identifiers: *American River Project (Calif), San Francisco Bay.

Conservative population projections estimate a 23% increase in the population of the East Bay (California) Municipal Utility District (EBMUD) by the year 2000. At present water supply consumption levels, this would result in a 92% increase in water use. In order to prevent future water shortages, the EBMUD adopted a Water Management Plan in October, 1972. Key to this is the American River Project, based on a contract for 134 mgd of American River water to be taken from Folsom South Canal. Public health considerations, such as nutrient content, turbidity, the presence of nuisance organisms and pollution of watershed areas, were a major factor in the choice of the American River over the Sacramento River. Although the District is convinced that the American River Project will meet future water demands, it is also implementing a realistic approach toward wastewater reclamation and reuse, desalting, weather management, watershed management, and water conservation. Difficulties associated with dependence on reclaimed water result from the high cost of processing and the poor quality of the water, which restricts its use to industrial purposes. High cost is also the primary impediment to using desalted water. (Hoffman-North Carolina)
W73-15023

PRIORITY RANKING OF FUTURE FLOOD CONTROL INVESTMENTS,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
S. L. Chiang.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 230-236, 1973. 2 fig, 2 tab.

Descriptors: *Decision making, *Flood control, Flood damage, Economics, Cost-benefit analysis, *Demand, *Supply, Flood protection, Flood frequency, Investment, Water management (Applied), *Water demand.

Because of limited budgets available for flood control purposes, the priority ranking flood control investments is necessary. A ranking method is given, based on demand-supply study of a basin using historical flood damage data, flood frequency information, as well as the inventory of the existing and proposed flood control structures. Demand is defined as the annual flood damage, and supply is the annual flood control investment. The difference, D-S, and the ratio, S/D, provide decision makers with a useful tool for determining general priority of future investments. The D-S represents the future maximum potential investments; S/D indicates the degree of investment to date. Therefore, the watershed with high D-S and low S/D should have high priority for future protection. The product of (D-S) and (1 - S/D), which takes into account both factors influencing the priority, may be used to rank the priority objectively. Thus the formula, (D/S) X (1 - S/D), may be called the priority ranking function. (Knapp-USGS)
W73-15045

MARITIME PROVINCES WATER RESOURCES STUDY, STAGE 1, VOL 1, SUMMARY.
Montreal Engineering Co. Ltd. (Quebec).

Prepared for Atlantic Development Board, Ottawa, Canada, January 1969. 87 p, 6 fig, 6 tab, append.

Descriptors: *Water supply, *Water demand, *Environmental effects, *Canada, Facilities, *Distribution systems, Financing, Costs, Water quality, Pollutants, Water requirements, Data collections, Capital costs.
Identifiers: *Utility extension, Water resources study, *Maritime Provinces (Canada).

A two year study of the quantity and quality of water resources in the Canadian Maritime Provinces is summarized. Present and future demands are assessed; areas with existing or impending problems, conflicts or opportunities are identified. Discussed are: current demand inventories and forecast of demands to 1981, with future indications; a study of water utilization characteristics of major water-using industries relevant to the Maritime Provinces; studies of hydrometeorology and hydrogeology to determine quantity and quality of surface and ground-water supplies; study of the adequacy of data collection networks plus identification of necessary improvements; inventory of existing water supply facilities and development possibilities; commentaries on recent developments and techniques for improving water quantity and quality; and analysis of demand and supply to identify areas with substantial possibilities or significant problems; and a preliminary ranking of areas for future detailed planning studies. Some conclusions are: (1) Maritime Provinces are abundantly endowed with surface and ground water although some isolated areas have water shortages. Development costs will be high; (2) Pollution is an important recurring problem. Large investments will be required, in the order of $251 million in capital expenditures for the region; (3) More urban water utilities will need to undertake major expansions in the next 10 to 15 years involving expenditures of at least $60 million; (4) fire protection, water quality and operating deficiencies are common; (5) greater involvement by provincial governments is necessary. (Edwards - North Carolina)
W73-15202

A SURVEY OF LONG-TERM WATER REQUIREMENTS IN JAPAN.
Economic Commission for Asia and the Far East (UN), New York.

Water Resources Journal, United Nations Economic Commission for Asia and the Far East (ECAFE), p 18-28, December 1972. 7 fig, 7 tab.

Descriptors: *Water resources development, *Water demand, *Inter-basin transfers, Reservoir design, Irrigation water, Water supply, Hydroelectric power, Water transfer, Flood control, Water pollution control, Planning.
Identifiers: *Japan.

Although Japan has more precipitation than many other countries, the seasonal variation of precipitation is large and streamflow fluctuates considerably. Moreover, due to topographical conditions, there are few sites suitable for the construction of large reservoirs. This makes the efficient utilization of water resources difficult. The total annual runoff of the rivers in Japan is approximately 520,000 million cu. m. If all the flows in the headwaters were totally controlled by upstream dams, the maximum utilization rate of runoff would be about 40%. Utilization of the midstream and downstream flows will be necessary. The construction of at least 760 dams and other facilities will be required. Inter-basin transfers of river flows require construction of some 480 dams and other facilities. It is essential that effective measures be taken to economize the use of agricultural water, to recycle the use of drainage water and to improve the recovery rate of used water. More intensive utilization of flows as envisaged will caused the extensive pollution of the rivers, which is likely to pose a serious problem. (Knapp-USGS)
W73-15272

6E. Water Law and Institutions

THE EFFECTS OF DIMINISHED GROUNDWATER SUPPLIES ON SELECTED NEW HAMPSHIRE INDUSTRIES,
New Hampshire Univ., Durham. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 04B.
W73-14766

PROTECTION OF WATER BODIES IN THE USSR FROM POLLUTION (OKHRANA VODOYEMOV V SSSR OT ZAGRYAZNENIYA),
For primary bibliographic entry see Field 05G.
W73-14853

INTERNATIONAL COOPERATION IN HYDROLOGY (MEZHDUNARODNOYE SOTRUDNICHESTVO V OBLASTI GIDROLOGII),
Hydrometeorological Service of the USSR, (Moscow).
V. I. Korzun.
Vodnyye Resursy, No 1, p 181-188, 1972.

Descriptors: *International Hydrological Decade, *Hydrology, Networks, Stations, Foreign countries, Conferences, Data collections, Organizations, Water resources, Water balance.
Identifiers: *USSR.

The problem of water is examined from social, scientific, and technical points of view, and achievements in hydrology are linked to the organization of international cooperation in this field. The program of the International Hydrological Decade (IHD) and its objectives in studying water resources, expanding scientific investigations, training and educating hydrologists, and facilitating information exchange are discussed. The most important objectives of IHD are: establishment of an international network of hydrologic stations; determination of effects of natural factors and human activity on hydrologic processes; and problems of the water balance. The important contribution of Soviet scientists to development of theoretical and practical aspects of problems undertaken by IHD is noted. (Josefson-USGS)
W73-14855

FACTORS AFFECTING INNOVATION IN WATER QUALITY MANAGEMENT: IMPLEMENTATION OF THE 1968 MICHIGAN CLEAN WATER BOND ISSUE,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W73-14871

LEGAL CONSTRAINTS ON URBAN WATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03D.
W73-14905

LOUISIANA SUPERPORT STUDIES: REPORT 1, PRELIMINARY RECOMMENDATIONS AND DATA ANALYSIS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 06B.
W73-15018

CONTROL OF WATER RESOURCES QUALITY: ADMINISTRATIVE ASPECTS,
Thames Conservancy, London (England).
For primary bibliographic entry see Field 05G.
W73-15028

SEWERAGE AND SEWAGE DISPOSAL: ADMINISTRATIVE AND TECHNICAL PRINCIPLES,
Thames Conservancy, London (England).
For primary bibliographic entry see Field 05G.
W73-15029

CONTROL OF WATER RESOURCES QUALITY: SCIENTIFIC AND TECHNICAL ASPECTS,
Thames Conservancy, London (England).
For primary bibliographic entry see Field 05G.
W73-15030

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX IV, APPENDIX V, APPENDIX VI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W73-15138

COASTAL ZONE MANAGEMENT ACT: A BROADER SCOPE FOR STATE INITIATIVE,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
R. Knecht.
Water Spectrum, Vol 5, No 1, p 32-36, 1973. 3 photo.

Descriptors: *Coasts, *Coastal areas, Beaches, Water resources, Land use, Land management, Land classification.
Identifiers: Coastal Zone Management Act.

The needs for clean air, clean water, clean beaches, good fishing, multiple use of natural resources and the increasing ability of Americans to buy a waterfront or beach front lot to escape the problems of environment degeneration has caused tremendous growth in efforts directed at coastal zone management and protection. The approaches taken by different states to regulate their coastal zones are described. States are compared on the basis of their recent legislative efforts, their general effectiveness and the long range planning involved. Federal action and legislation is discussed as it is administered by the National Oceanic and Atmospheric Administration. (Wadley-Florida)
W73-15142

MEANDERING RIGHTS FOR CONTRACTED WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. Walker, and W. Cox.
Water Spectrum, Vol 5, No 1, p 37-41, 1973. 3 map, 7 photo.

Descriptors: *Legal aspects, *Water law, *Water rights, *Riparian rights, *Prior appropriation, *Reservoirs, Domestic water, Discharge (Water), Water sources, Streams, Natural streams.

Federal reservoirs and contracts with municipalities for the waters in such reservoirs may be lulling the municipalities into a false sense of security with respect to future water shortages. Problems such as sending the water from the reservoir to the city down natural stream channels or the burden placed on the municipality by the enabling legislation to acquire valid water rights in the water often will put the municipality in direct conflict with pre-existing private rights in the same water. Problems associated with federal involvement in the supply picture, general water law concepts and rights derived therefrom, and acquisition and storage rights to the water are discussed. It is recommended that states reevaluate the protection afforded the municipality when water is conveyed by way of natural stream channels and the amount of state control retained over the uses made of the water. Some thought as well should be given to industrial and municipal uses obtaining storage rights in private hydroelectric projects. Other recommendations are included. (Wadley-Florida)
W73-15143

PROHIBITIONS AGAINST WATER POLLUTION.
N.Y. Sess. Laws, Ch. 664, Secs. 17-0501 through 17-1107 (McKinney 1973).

Descriptors: *New York, *Permits, *Penalties (Legal), *Water pollution, Sewage effluents, Water pollution control, Statutes, Legislation.

This statute, consisting of titles 5, 7, 9 and 11 of Chapter 664 of the New York Session Laws, 1973 deals with water pollution. Under this statute, it is unlawful for any person, directly or indirectly, to throw, drain, run or otherwise discharge into the waters involved any organic or inorganic matter that shall cause or contribute to a condition that contravenes the standards adopted by the department authorized by statute. The statute also includes prohibitions of pollution of waters of the marine district, permit requirements, prohibitions against modification of wastes discharged through existing outlets without the requisite permits, minimum treatment required, restrictions on discharge of sewage, industrial waste or other wastes, and procedure for notice, hearings and court reviews. (Wadley-Florida)
W73-15144

STATE V. GENERAL MOTORS CORPORATION (PROSECUTION OF CORPORATION FOR VIOLATION OF STATE STATUTE PROSCRIBING POLLUTION OF STATE WATER).
296 N.E.2d 317-320 (Mun Ct. of Newton Falls, Ohio, 1973). 4 p.

Descriptors: *Legal aspects, *Judicial decisions, *Water pollution sources, *Water pollution control, Environmental effects.

Defendant corporation prosecuted for failure to comply with state statute proscribing polluting state land and water. The court held that the elements of the offense had not been proved by the state and defendant was discharged. The company was charged with placing matter of an unsightly or unsanitary nature into a ditch or watercourse whose waters combine or effect a junction with natural surface or underground water. Three to five hundred gallons of the offending substance were accidentally discharged into the drainage system of the corporation and were trapped in a dam temporarily placed on private property for purposes of trapping and treating the affected waters. The state failed to show that the untreated waters ever combined or affected a junction with natural stream waters. Further, as the discharge was accidental, based on ignorance of fact, a valid defense was offered by the corporation. (Wadley-Florida)
W73-15145

ENVIRONMENTAL DEFENSE FUND, INC. V. ARMSTRONG (ACTION BY ENVIRONMENTAL PROTECTION GROUPS AGAINST COMMISSIONER OF BUREAU OF RECLAMATION AND OTHERS FOR INJUNCTIVE RELIEF WITH RESPECT TO THE PROPOSED NEW MELONES DAM) .
356 F. Supp. 131-140 (ND. Calif. 1973). 10 p.

Descriptors: *Legal aspects, *Environmental effects, *California, *Dams, Engineering structures, Diversion structures, Water supply, Reservoir yield.
Identifiers: Environmental impact statement (Construction), Environmental impact statement (Adequacy).

An environmental impact statement was prepared by the United States Corps of Army Engineers for a proposed dam project. The statement was challenged by environmental protection groups as being insufficient to comply with standards required by the National Environmental Policy Act of 1969 (NEPA). The court held that while the statement needed supplementation, it complied with the requirements of NEPA. All reasonable alternatives to the project had been considered and in its supplemental form the statement added the necessary detail required. The objection of the environmental groups focusing primarily on the lack of detail regarding use priorities, water supply situations and alternative supply sources are discussed by the court and rejected. The court, nevertheless, retained jurisdiction over the matter to insure full compliance with its order in the form of a further statement or at least additional data on the operation of the project prior to the actual use of any of the conservation yield of the dam. (Wadley-Florida)
W73-15146

STREAM CHANNELIZATION (A CRITIQUE OF CEQ'S CHANNELIZATION REPORT),
Arkansas Wildlife Federation, Little Rock.
K. Hampton.
Arkansas Out-of-Doors, Vol 2, No 6, p 2, June 1973.

Descriptors: *Stream improvement, *Channel improvement, *Environmental effects, *Erosion, Streamflow, Streams, Stream erosion, Stream stabilization, Channel erosion, Ecology, Erosion control, Wetlands, Drainage, Habitat, Water table, Water levels, Downstream aesthetics, Natural resources, Water resources, Land resources, Wildlife.
Identifiers: *Stream channelization.

Following the publication of the final report on stream channel modification prepared for the President's Council on Environmental Quality, this article reports the mixed conclusions concerning the effects of stream channelization on the physical environment. Of 42 projects studied, 11 had a pronounced significance to wetland drainage and land use changes. A dramatic loss of hardwoods in the Mississippi Delta has resulted from five of the projects. Water table level and stream recharge capability were adversely affected. Some of the projects studied showed low actual or potential contribution to the natural erosion and sediment problem; others were classified as 'uncertain' and a few had a clear adverse effect. Some projects induced clearly adverse downstream effects. Somewhat less than half the projects caused considerable localized adverse change in the appearance of the environment. It is suggested that there is a strong correlation between channel project dimension and intensity of physical effects. Other findings were made relative to channeling effects on fish and wildlife resources, habitat, productivity and species diversity. (Reed-Florida)
W73-15147

THE FEDERAL COASTAL ZONE MANAGEMENT ACT OF 1972,
Louisiana State Univ., Baton Rouge. Office of Sea Grant Development.
M. Hershman.
Available from the National Technical Information Service as COM-73 10313. Louisiana Coastal Law, Report No 8, p 1-6, December 1972.

Descriptors: *Legislation, *Coasts, *Grants, *Federal government, Administrative agencies, Coastal engineering, Coastal structures, Coastal plains, Coastal marshes, Projects, Water law, Management, Administration, Legal aspects, Permits, Planning, Governmental interrelations.
Identifiers: *Coastal Zone Management Act of 1972, Coastal zone management.

In this description and interpretation of the Coastal Zone Management Act of 1972 (Act), the historical factors that resulted in the Act are discussed. Under the Act, state governments are the focal point for coastal zone management. Grants to assist the state in developing a management program are followed by grants to assist the state in administering their programs. Only those coastal lands which have a direct and significant impact on coastal waters may be regulated under the Act. The legislation does not require state participation, but does offer a financial incentive for such participation. Under the interagency coordination and cooperation provisions, the views of affected agencies must have been considered by the State prior to the Secretary of Commerce's approval of the management program. Once approved, federal agency activities must be consistent with the coastal management programs of that state, to the maximum extent practicable. Specific state legislation will be necessary to comply with the Act. Under the Act, a state could emphasize preservation or development. The Act should be flexible enough to accommodate and enhance state efforts that have preceded it. For purposes of requesting federal grants, distinction will have to be made between coastal and land use management. (Reed-Florida)
W73-15148

A BILL TO ESTABLISH THE BIG THICKET NATIONAL PARK IN TEXAS.

Senate Bill 314, 93rd Cong, 1st Sess (1973). 3 p.

Descriptors: *Texas, *Streams, Natural streams, Land use, Land management.
Identifiers: *Big Thicket National Park (Tex).

This bill proposes the establishment of the Big Thicket National Park (Park) in Texas. The purpose of the legislation is to preserve the outstanding botanical, zoological, geological, archeological and ecological values of the area, together with the recreational, historical, scenic and natural values of the area as a wildlife habitat and recreational area. The bill provides for the acquisition of the necessary land for the park and for administration of the park once it is established. Bill emphasizes preservation of free-flowing streams in area to be covered by park. (Wadley-Florida)
W73-15149

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT BY ESTABLISHING STANDARDS FOR SYNTHETIC DETERGENTS.

House Bill 3107, 93rd Cong, 1st Sess (1973). 14 p.

Descriptors: *United States, *Detergents, *Federal Water Pollution Control Act, *Legislation, *Phosphates, Public health, Phosphorus, Chemical water, Water pollution sources, Eutrophication, Water quality, Biodegradation, Legal aspects, Penalties (Legal).

This bill would amend the Federal Water Pollution Control Act so as to establish standards which must be met by all synthetic detergents and to ban from detergents all phosphates and those synthetics which fail to meet the standards by a specified date. Standards of water eutrophication ability, biodegradability, toxicity and effects on the public health and welfare will be established which must be met by all synthetic detergents. The proposed bill details the basis upon which the standards are to be designed. A willful violation of these provisions of the proposed Act is to be considered a misdemeanor punishable by a fine. An inventory and report on existing technology or substitutes for polyphosphates in detergents will be made. The Interior Department will assist in the research and development of formulations which will eliminate pollutants from detergents. After a specified date, it will be unlawful for any person to import or manufacture any detergent formulation containing phosphorus not in compliance with the proposed standards. (Reed-Florida)
W73-15150

A BILL TO AUTHORIZE THE ESTABLISHMENT OF THE FLORIDA FRONTIER HISTORIC RIVERWAY.
House Bill 64, 93d Cong, 1st Sess (January 3, 1973). 4 p.

Descriptors: *Florida, *Estuaries, Legal aspect.
Identifiers: *Nassau River, Florida Frontier Historic Riverway, Estuarine protection, Land acquisition.

The bill proposes the establishment of the Florida Historic Riverway (riverway) and provides for the acquistion and mangement of the various components of the riverway. The riverway involves primarily the Nassau River estuary but will include some lands other than estuarine marshes and streambeds. The lands will be acquired by the Department of the Interior (Department) by donation, purchase or exchange and once sufficient lands are available to insure the realization of the purposes of the act, the Secretary of the Department will establish the riverway by appropriate publication in the Federal Register. Also included will be the Castillo de San Marcos National Monument, the Fort Mantanzas National Monument, and the Fort Caroline National Memorial. (Wadley-Florida)
W73-15151

FLORIDA COURTS AND WATER POLLUTION: A FLOATING CRAP GAME,
L. Fischer.
Environmental Law, Vol 2, No 1, p 189-195, Winter 1971. 28 ref.

Descriptors: *Florida, *Sewage treatment, *Sewage disposal, *Outfall sewers, Condemnation, Easements.
Identifiers: Ocean outfall disposal.

The town of Palm Beach, Florida sought to resist an attempt of the city of West Palm Beach to condemn a strip of land for use as a sewage disposal system utilizing an ocean outfall. Palm Beach argued that while the sewage system proposed was admittedly a public purpose, it was against the public policy of the state due to the low level of treatment required. The court decided in favor of West Palm Beach. The decision and the implications thereof are analyzed citing analogous Florida cases and relevant provisions of the rules of the Department of Air and Water Pollution Control, the Federal Water Pollution Control Act and the Water Quality Improvement Act of 1970. (Wadley-Florida)
W73-15152

WALTON V. ST. CLAIR: THE STANDING QUESTION,
Popham, Haik, Schnobrich, Kaufman and Doty Ltd., Minneapolis, Minn.
F. S. Richards.
Natural Resources Law, Vol 4, No 1, p 47-59, January 1971. 47 ref.

Descriptors: *Minnesota, Legal aspects, Environmental control, Rivers.
Identifiers: Standing to sue, Prevention of mineral exploration, Boundary Waters Canoe Area.

The Izaak Walton League (League) of America sought to prevent mineral exploration in the Boundary Waters Canoe Area of northeastern Minnesota. In addition to the substantive issues of the extent of mineral interests in the area and to what degree governmental officials have implemented legislative and executive laws, rules and regulations pertinent to the area, the question of standing to sue was fundamental to the prosecution of the League's claims. The League asserted that as a private party it had standing to assert its claims for declaratory judgment in the federal court and the court allowed the League to maintain the action over the objection of the defendant parties. The history of the standing to sue controversy in recent years is discussed detailing the modifications of the rule. Even with the extensive erosion caused by recent cases, a plaintiff must still show where he has a personal stake or some special interest in seeking judicial relief even though such interest need not be purely economic. The interest of the League in this particular case is discussed. The court properly held the League had standing to sue. (Wadley-Florida)
W73-15154

QUO WARRANTO TO ENFORCE A CORPORATE DUTY NOT TO POLLUTE THE ENVIRONMENT,
For primary bibliographic entry see Field 05G
W73-15155

TAKING VERSUS REASONABLE REGULATION: A REAPPRAISAL IN LIGHT OF REGIONAL PLANNING AND WETLANDS,
D. Binder.
University of Florida Law Review, Vol 25, No 1, p 1-43, Fall 1972. 48 p, 344 ref.

Descriptors: *Wetlands, *Legal aspects, *Water resources development, *Regulation, Marshes, Eminent domain, Constitutional law, Aquatic environment, Land reclamation, Wildlife conservation, Coastal marshes, Tidal marshes, Water utilization, Water Management (Applied), Water zoning, Administration, Regional development.

A comprehensive analysis is presented of the constitutional dilemma involved in the taking of private property for public use as opposed to reasonable regulation in light of current activities involving regional planning and wetlands. The important distinctions between the police power and eminent domain are described and the status of the law today is discussed. The proper test to be employed must balance various rights. These legal doctrines, as well as the legislative response, are then discussed with reference to wetlands. Wetlands conservation presents the taking-regulation problem in its most acute form. Although the value of wetlands to the public is paramount, the necessary restrictions may make the land almost unusable, while the cost of acquisition by eminent domain is prohibitive. Regional planning is the best means of equitably distributing the burdens occasioned by wetlands preservation. Although a diminution in value will ordinarily result to the wetlands owners involved, this will partially be offset by a corresponding decrease in property taxes. (Mockler-Florida)
W73-15156

LERRO V. THOMAS WYNNE, INC. (ACTION BY PROPERTY OWNERS THROUGH WHOSE PROPERTY CREEK FLOWED AND WHO WERE AFFECTED BY PRESENCE OF FUEL OIL IN THE CREEK).
301 A.2d 705-708 (Pa. 1973).

Descriptors: *Pennsylvania, *Judicial decisions, *Underground storage, *Oil pollution, Oil wastes, Storage tanks, Water quality control, Oily water, Water pollution sources, Negligence, Legal aspects, Fuels, Corrosion.

An equity action by plaintiffs--nearby residents and property owners against a corporate defendant that owned and operated apartment houses is discussed. Between 1963 and 1968 large quantities of fuel oil leaked from a corroded 10,000 gallon tank buried in the ground on defendant's property. As a result of corrosion, holes developed in the tank, and the fuel oil seeped into the ground and flowed underground through adjoining properties into a creek which flowed through plaintiffs' property. Petroleum odors emanated from the creek, and the fuel oil caused a discoloration of the sides of the raceway of the creek, a discoloration of the water, and adhered to the clothing and shoes of children playing in the creek, resulting in a tracking of oil into homes. The flow of the seeping oil into the stream created a definite, visible, and noticeable problem. The court held that the corporate owner and operator of the apartment house was negligent in that it should have known of the risk of corrosion to a 10,000 gallon tank buried in the ground and supplying fuel oil for heating the apartment house and should have provided for periodic inspections which were inexpensive and simple. (Mockler-Florida)
W73-15157

CONSERVATIONIST'S STANDING TO CHALLENGE THE ACTIONS OF FEDERAL AGENCIES,
M. Hardin
Ecology Law Quarterly, Vol 1, No 2, p 305-329, Spring 1971. 24 p, 105 ref

Descriptors: *Legal aspects, *Judicial decisions, *Water conservation, Conservation, Legal review, Administration, Administrative agencies, Natural resources, Legislation, Federal government, Court decisions, Law enforcement, Water law, Penalties (Legal), Environment, Social aspects, Ecology, Environmental effects
Identifiers: *Standing (Legal), Private actions (Legal).

While the federal government has long possessed broad regulatory powers to preserve natural resources, administrative bottlenecks have prevented effective implementation and enforcement of available legislation. It is left to private actions, therefore, to compel the needed enforcement and halt environmental damage. The courts must be accessible to the qualified conservationist if private suits are to be an effective means of enforcing existing law. The liberality of the doctrine of standing to sue is important in this context. New tests for standing should prove useful to conservationists attempting private actions. There are three general requirements of standing: (1) there must be a case or controversy, (2) the interest sought to be protected by the complainant must be within the zone of interests protected by the statute or constitutional guarantee in question, and (3) the statute whose guarantees are being invoked must not positively deny standing to the plaintiffs bringing the action. The main thrust of the holdings in two recent cases discussed was to reduce substantially the threshhold requirements of standing. (Glickman-Florida)
W73-15158

TOWN OF SALEM V. COUNTY OF KENOSHA (SUIT TO DETERMINE CONSTITUTIONALITY OF SHORELANDS AND FLOODLANDS ORDINANCE).

204 N.W.2d 467-469 (Wis. 1973).

Descriptors: *Wisconsin, *Legal aspects, *Zoning, Flood plain zoning, Land use, Shore protection.
Identifiers: Sanitation ordinance.

The town of Salem sued to test the constitutionality of an ordinance passed by the County of Kenosha dealing with floodlands and shorelands zoning. While the court held that the town had standing to bring the suit it had not proerly pleaded a cause of action for which the relief could be granted. The particular ordinance was argued to be a sanitary ordinance rather than a zoning ordinance by the town and it was further argued that such an ordinance was not applicable to the town as it already had a similar ordinance of its own. The complaint, however, failed to include an allegation that the county ordinance in question was a sanitary ordinance or that it was passed under any particular statutory sections and as such did not state a cause of action. (Wadley-Florida)
W73-15159

GIBBS V. WRIGHT (ACTION TO DETERMINE RIGHT TO OBTAIN WATER FROM SPRING),

195 S.E.2d 40-44 (Ct. App. N.C. 1973).

Descriptors: *North Carolina, *Judicial decisions, *Easements, *Springs, Adjacent landowners, Legal aspects, Water law, Boundaries (Property), Freshwater, Spring waters, Surface waters, Water rights, Prescriptive rights, Water policy, Reasonable use, Domestic water, Consumptive use, Water utilization.

Plaintiffs, owners of property upon which a spring was located, sought a declaratory judgment against defendants, owners of adjacent property, to determine defendants' right to obtain water from the spring. Plaintiffs' predecessor in title orally agreed to allow defendants' predecessor in title to run a pipe from the stream to his house, provided that he limit himself to reasonable use. The trial court held that a duly recorded easement had been granted. On appeal, plaintiff contended that the right granted to obtain water from the spring was not an easement appurtenant to the land, but a personal license limited to the original grantee. The appellate court upheld the decision of the lower court, stating that whether an easement was appurtenant or in gross depended on the intent of the parties creating it. Where it may be so construed, the law favors appurtenant easements which was found to be the nature of the easement in this case. The original judgment was modified to make clear that defendants' rights are nonexclusive of plaintiffs' continuing rights also to make reasonable use of the spring. (Mockler-Florida)
W73-15160

DRINKWINE V. STATE OF VERMONT (SUIT TO RESTRAIN STATE FROM OPERATION OF PUMPS AND DRILLED WELLS LOCATED ON ITS PROPERTY).
300 A.2d 616-618 (Vt. 1973).

Descriptors: *Vermont, *Groundwater, Legal aspects, *Water rights, *Water wells, Pumping.

Suit was brought to restrain the state from pumping from wells located on the state property. Plaintiff argued that such pumping was unreasonable in that it lowered the water table in and around plaintiff's land and dried up his springs. The court held that the law of the jurisdiction was well settled that the owner of land was absolute owner of the groundwater under the land and that since the state did not apply the reasonable use doctrine to groundwater, the injunction would not lie against the state. The only remedy available to plaintiffs would be for damages, if any. (Wadley-Florida)
W73-15161

DEEP WATER PORT POLICY ISSUES.
Hearing--Comm. on Interior and Insular Affairs--United States Senate, 92d Cong, 2d Sess, April 25, 1972. 687 p, 11 fig, 2 plate, 2 map, 19 tab, 7 chart, 4 append.

Descriptors: *Federal government, *Legislation, *Harbors, *Deep water, Coastal engineering, Transportation, Legal aspects, Fuels, Bodies of water, Resources development, Port authorities, Navigation, Transportation, Water resources development, Project planning.
Identifiers: *Deep water ports.

The minutes are presented of Senate hearings on current federal programs and plans for the formulation of a national policy for deep water port development in the U.S. The open hearing was part of the Committee's National Fuels and Energy Policy Study being conducted under the authority of Senate Resolution 45. From the hearings the committee hoped to ascertain the current policies of federal agencies toward deep water port development; and what the elements of an overall national policy ought to be. Particular attention was devoted to what role the federal government should play in the selection and development of deep water facilities and whether it should take on new responsibilities for centralized planning and policy development. The testimony indicates that the future energy needs of the U.S. necessitate that Congress and the Executive Branch give careful consideration to the implications of deep water ports with regard to the many national concerns including security of our fuel supplies, total energy costs, U.S. balance of payments, and maritime regulations. The testimony of government officials, pertinent technical documents, and correspondence from interested parties are included. (McKnight-Florida)
W73-15163

NEW COMMITMENT FOR CLEANER WATER,
Senate, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-15164

REPORT ON THE WATER LEVELS OF THE GREAT LAKES.

Hearing--Subcomm. on Water Resources--Comm. on Public Works, U.S. House of Representatives, 93rd Cong. 1st Sess, April 1973. 84 p, 3 tab.

Descriptors: *Water levels, *Water distribution, Illinois, Water policy, Water sources, Regulation, Planning, *Great Lakes, *Lake Michigan, Legal aspects.

Testimony was taken and material received for the record concerning problems of water levels on the Great Lakes. Problems of erosion due to a rise in the level of the lakes is discussed and increased diversion of water from Lake Michigan is proposed. A legislative proposal for assistance of an emergency nature to repair threatened or destroyed structures and to provide for emergency erosion control is included. Much of the rise in lake levels is attributable to increases in precipitation and appropriate tables detailing these increases are included. Also discussed are problems to be expected by increasing discharges into waterways such as the Mississippi River. (Wadley-Florida)
W73-15165

BRIEFING--MISSISSIPPI RIVER.
For primary bibliographic entry see Field 04A.
W73-15166

MERCURY POLLUTION AND ENFORCEMENT OF THE REFUSE ACT OF 1899 (PART 3).
For primary bibliographic entry see Field 05G.
W73-15167

THE GREAT LAKES BASIN: ALTERNATIVE INSTITUTIONAL ARRANGEMENTS FOR MULTI-PURPOSE RESOURCES MANAGEMENT,
Guelph Univ. (Ontario). Centre for Resources Development.
N. Pearson.
Background Paper for Canada-United States University Seminar on Institutional Arrangements for the Integrated Management of Water and Land Resources of the Eastern Great Lakes - 1971-1972. Centre for Resources Development, University of Guelph, Ontario. Publication No 55, February 1972. 27 p.

Descriptors: *Water management (Applied), *Administration, Coordination, *Great Lakes Basin, *Institutional constraints, Political aspects, Planning, Canada, United States, Management, *Multiple-purpose projects.
Identifiers: *United States-Canadian Boundary Waters Treaty, Administrative conflicts.

Four primary reasons for changing present institutional arrangements for management of the Great Lakes Basin are identified: contraventions of the 1909 treaty, reported in 1918, still exist; procedures for problem identification, solution, implementation, and enforcement are at best cumbersome; the integration of water, land, and air within environmental entities such as natural drainage basins, must be recognized and planned for as a whole (rather than dealing only with water pollution, as is done today); rapid environmental degradation from urbanization, industrialization, and increased recreational demands has accelerated to a point of non-control by present guidance and control mechanisms. Alternative concepts of institutional relationships, varying from an informal working arrangement to a police force and a regional government, are critically examined. Different classes of institutional arrangements, ranging from a simple Inter-State-Provincial Concept to the much more complex Supra-National Authority, are analyzed in terms of feasibility and necessary authorization. None of the mentioned structures has the required capacity for multi-purpose resources management. Rather the functional approach of seeking to identify the key objectives, derived functions, objective criteria, and specific tasks should be used to design a new kind of institution. (Hoffman - North Carolina)
W73-15203

WATER POLLUTION CONTROL IN ASIA AND THE FAR EAST.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 05G.
W73-15271

6F. Nonstructural Alternatives

INTEGRATED HYDROLOGIC AND SOCIETAL INTERACTIONS TO FLOODS AND DROUGHTS IN INDIA,
Madhya Pradesh Government Control Board for Major Projects, Bhopal (India).
For primary bibliographic entry see Field 02E.
W73-15046

6G. Ecologic Impact of Water Development

IMPACTS OF WATER-RESOURCE DEVELOPMENT IN THE SNAKE RIVER AREA ON WILDLIFE,
Washington State Univ., Pullman. Dept. of Zoology.
I. O. Buss, and W. H. Funk.
Available from the National Technical Information Service as PB-223 911, $3.00 in paper copy, $1.45 in microfiche. Washington Water Research Center, Pullman, Project Completion Report, July 1973. 43 p. OWRR A-054-WASH (2).

Descriptors: Ecology, Dams, Geese (Wild), Ducks (Wild), *Waterfowl, *Washington, Management, Wildlife, *Snake River, Environmental effects, Animal populations, *Wildlife, Habitats, *Pre-impoundment, Rodents, Reservoir sites.
Identifiers: *Game animals.

Four approaches were used to study the ecologic impact of drawdown and storage of water behind dams for flood control and power on wildlife population changes in the Snake River canyon, southeast Washington. The first approach involved availability of aquatic macroinvertebrates as a potential food source for waterfowl. Data gathered at five collecting stations, from freeflowing to impounded water, showed a conspicuous transition from one benthic invertebrate community to the other as a result of decreasing current velocity and increased sedimentation. The second

approach was to record changes in relative numbers and distribution of vertebrate animals as a result of flooding riparian habitat. Number of vertebrates observed per transect mile for 21 transects showed that in all seasons studied to date, between 42 and 54 percent of all sightings occurred in river bank and floodplain vegetation, all of which will be destroyed by impoundment by Lower Granite Dam. The third approach involved seasonal trapping of small mammals along the 21 transects. Of three species of mice accounted for to date, Peromyscus maniculatus was by far the most common mammal caught (214 of 224 or 96%). In both winter and spring studies 50-75 percent of the mammals were trapped below prospective pool level in riparian habitat. The fourth approach involved information on hunter-killed game animals collected in the Snake River study area during fall hunting seasons to supplement data obtained by counting animals on the 21 transects. A total of 821 hunters (375 parties) spent 3,801 hours (about 4.6 hours hunting per man) and shot 525 game animals (7.24 man hours per animal), resulting in about 40 percent of the hunting parties being successful. These data provide year-to-year index figures that indicate population trends which will be valuable in appraising the impact of riparian habitat destruction on wildlife.
W73-14773

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF ENRICO FERMI ATOMIC POWER PLANT - UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-14979

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF DUANE ARNOLD ENERGY CENTER.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-14980

DAYS CREEK LAKE PROJECT, SOUTH UMPQUA RIVER, DOUGLAS COUNTY, OREGON, (FINAL ENVIRONMENTAL STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-15017

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX 1, CORRESPONDENCE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W73-15137

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX IV, APPENDIX V, APPENDIX VI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W73-15138

ENVIRONMENTAL DEFENSE FUND, INC. V. ARMSTRONG (ACTION BY ENVIRONMENTAL PROTECTION GROUPS AGAINST COMMISSIONER OF BUREAU OF RECLAMATION AND OTHERS FOR INJUNCTIVE RELIEF WITH RESPECT TO THE PROPOSED NEW MELONES DAM).
For primary bibliographic entry see Field 06E.
W73-15146

STREAM CHANNELIZATION (A CRITIQUE OF CEQ'S CHANNELIZATION REPORT),
Arkansas Wildlife Federation, Little Rock.
For primary bibliographic entry see Field 06E.
W73-15147

A BILL TO AUTHORIZE THE ESTABLISHMENT OF THE FLORIDA FRONTIER HISTORIC RIVERWAY.
For primary bibliographic entry see Field 06E.
W73-15151

WALTON V. ST. CLAIR: THE STANDING QUESTION,
Popham, Haik, Schnobrich, Kaufman and Doty Ltd., Minneapolis, Minn.
For primary bibliographic entry see Field 06E.
W73-15154

CONSERVATIONIST'S STANDING TO CHALLENGE THE ACTIONS OF FEDERAL AGENCIES,
For primary bibliographic entry see Field 06E.
W73-15158

RIRIE DAM AND LAKE, WILLOW CREEK, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 04A.
W73-15162

CONSTRUCTION OF MOORING FACILITIES, OHIO RIVER NAVIGATION SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Ohio River Div. Labs., Mariemont.
For primary bibliographic entry see Field 08A.
W73-15168

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF VIRGIL C. SUMMER NUCLEAR STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15235

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF QUAD-CITIES NUCLEAR POWER STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15236

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF COOPER NUCLEAR STATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15237

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF TURKEY POINT PLANT, UNITS 3 AND 4.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-15243

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-15256

07. RESOURCES DATA

7A. Network Design

A NATIONAL WATER GRID FOR INDIA.
Economic Commission for Asia and the Far East (UN), New York
For primary bibliographic entry see Field 04A
W73-15270

7B. Data Acquisition

NEW FLUORESCENT TRACER DETECTION TECHNIQUES FOR USE IN POLLUTED ENVIRONMENTS,
Rhode Island Univ., Kingston. Dept. of Physics
For primary bibliographic entry see Field 05B
W73-14770

THE IZAA SPRECTROMETER: A DETECTOR FOR TRACE ELEMENTS IN GASES, LIQUIDS, AND SOILS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 02K.
W73-14785

DETERMINATION OF TRACE QUANTITIES OF ARSENIC IN WASTEWATERS BY CARBON ROD ATOMIC ABSORPTION SPECTROMETRY,
Los Angeles County Sanitation District, Whittier, Calif. San Jose Creek Water Quality Lab.
For primary bibliographic entry see Field 05A.
W73-14786

OBSERVATIONS OF SHALLOW LAYERING UTILIZING THE PINGERPROBE ECHO-SOUNDING SYSTEM,
Texas Univ., Galveston. Earth and Planetary Sciences Div.
For primary bibliographic entry see Field 02J.
W73-14812

COMPARISON OF RADIOACTIVE GLASSES OF SCANDIUM AND IRIDIUM AS TRACERS IN SEDIMENT-TRANSPORT STUDIES,
Bhabha Atomic Research Center, Bombay (India). Isotope Div.
For primary bibliographic entry see Field 02J.
W73-14826

EXPERIMENTS IN TRACING UNDERGROUND WATERS IN LIMESTONES,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02F.
W73-14830

TESTING OF METHODS FOR DETERMINATION OF URBAN RUNOFF,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-14835

ENVIRONMENTAL MONITORING HELPS RESOLVE POLLUTION PROBLEMS,
Westinghouse Electric Corp., Raleigh, N.C. Meter Div.
For primary bibliographic entry see Field 05A.
W73-14917

INSTRUMENTATION FOR MEASUREMENT OF BEACH WATER-TABLE FLUCTUATIONS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14986

GROUNDWATER FLOW IN A SANDY TIDAL BEACH. 1. ONE-DIMENSIONAL FINITE-ELEMENT ANALYSIS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02F.
W73-14989

AQUIFER DIFFUSIVITY OF THE OHIO RIVER ALLUVIAL AQUIFER BY THE FLOOD-WAVE RESPONSE METHOD,
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 02F.
W73-14991

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 02H.
W73-14993

STATISTICAL COMPARISON OF AIRBORNE LASER AND STEREOPHOTOGRAMMETRIC SEA ICE PROFILES,
Naval Oceanographic Office, Washington, D.C. Polar Oceanography Div.
For primary bibliographic entry see Field 02C.
W73-14999

REMOTE MEASUREMENT OF SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 02L.
W73-15001

SUSPENDED SEDIMENT OBSERVATIONS FROM ERTS-1,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-15002

THE USE OF NEAR-INFRARED PHOTOGRAPHY IN THE ANALYSIS OF SURFACE MORPHOLOGY OF AN ARGENTINE ALLUVIAL FLOODPLAIN,
Texas Univ., Austin. Dept. of Geography.
For primary bibliographic entry see Field 02E.
W73-15003

A PATTERN OF MUSKEG--A KEY TO CONTINENTAL WATER,
New Brunswick Univ., Fredericton. Muskeg Research Inst.
For primary bibliographic entry see Field 02C.
W73-15005

UNRELIABILITY OF THE C-14 METHOD FOR ESTIMATING PRIMARY PRODUCTIVITY IN EUTROPHIC DUTCH COASTAL WATERS,
Netherlands Inst. for Sea Research, Den Helder.
For primary bibliographic entry see Field 05A.
W73-15078

SAMPLING BIAS OF A LONGHURST-HARDY PLANKTON RECORDER,
Scripps Institution of Oceanography, La Jolla, Calif.
L. R. Haury.
Limnology and Oceanography, Vol 18, No 3, p 500-506, May 1973. 3 fig, 1 tab, 14 ref.

Descriptors: *Sampling, *Zooplankton, Mechanical equipment, Aquatic populations, Estimating.
Identifiers: *Bias, *Longhurst-Hardy plankton recorder, Recorders, Accuracy.

The sampling bias due to the residence time of organisms within the net of a vertically towed Longhurst-Hardy plankton recorder was investigated by injecting plastic pellets and preserved zooplankton into the net mouth at known times during tows. The shortest residence time was 13 sec for tow speeds of from 86 to 103 cm per sec; most plankters remained in the net much longer. The injected plankton stalled within the net intermittently, causing artificial fluctuations in abundance along the recorder gauze. Differences in tow speed caused changes in stalling characteristics. Underestimates of total plankton abundance occurred, probably due to leakage through the recorder and to permanent hangups on the net. (Little-Battelle)
W73-15080

A MESSENGER-OPERATED CLOSING TRAWL,
University of South Florida, St. Petersburg. Marine Science Inst.
T. L. Hopkins, R. C. Baird, and D. M. Milliken.
Limnology and Oceanography, Vol 18, No 3, p 488-490, May 1973. 1 fig, 3 ref.

Descriptors: *Sampling, *Design, Mechanical equipment, Trawling, Plankton.
Identifiers: *Tucker trawl.

A closing system has been developed for a Tucker trawl which offers an inexpensive, reliable alternative to the more costly and complicated acoustic and clock-timer equipment previously used. The Tucker trawl is a modification of the trawl described by Davies and Barham (1969), but uses a messenger-actuated mechanism. Knotted or knotless nylon netting is used on the trawl to which a 0.5-m plankton net is attached. The catch bucket is a 50-cm section of thick-walled PVC tubing closed at one end with a stock pipe-end fused to the tubing. Holes 12 mm in diameter are drilled in the end to facilitate movement of organisms into the bucket. The bucket is fitted with 333-micron mesh to retain the catch. The trawl is also fitted with a flowmeter which records only when the net is fishing. Trawls with release mechanism, flowmeter, and time-depth recorder cost about 1500 dollars each. (Little-Battelle)
W73-15081

SIMPLE APPARATUS FOR CONDUCTING ACUTE TOXICITY BIOASSAYS UNDER FIELD CONDITIONS,
Department of the Environment, Winnipeg (Manitoba). Fisheries Service.
For primary bibliographic entry see Field 05A.
W73-15084

A RAPID METHOD FOR CLEARING DIATOMS FROM TAXONOMIC AND ECOLOGICAL STUDIES,
Oklahoma Univ., Willis. Biological Station.
For primary bibliographic entry see Field 05A.
W73-15115

ION SELECTIVE FLOW-THROUGH ELECTRODES: CONSTRUCTION AND PROPERTIES OF HEAVY METAL SENSORS,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-15170

A ROTARY SIEVE FOR REMOVING MUD FROM BOTTOM DEPOSIT SAMPLES,
Glasgow Univ. (Scotland).
H. D. Slack.
Freshwater Biol. Vol 2, No 2, p 159-162, 1972. Illus.
Identifiers: Animals, *Bottom deposits, *Mud removal, Samples, *Sieve (Rotary).

An electrically driven sieve is described which reduces the time and labor required for the separation of animals and debris from the muds of bottom deposit samples.--Copyright 1973, Biological Abstracts, Inc.
W73-15210

7C. Evaluation, Processing and Publication

ANALYSIS OF MULTIPLE-INPUT STOCHASTIC HYDROLOGIC SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-14753

SIMULATION OF THE QUANTITY AND QUALITY OF FLOW IN A RIVER BASIN,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 02A.
W73-14765

MAPPING HYDROCARBON SEEPAGES IN WATER-COVERED REGIONS,
Shell Oil Co., New York. (assignee)
For primary bibliographic entry see Field 05G.
W73-14776

APPLICATION OF THE GRID SQUARE TECHNIQUE TO MAPPING OF EVAPOTRANSPIRATION,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02D.
W73-14824

INTERNATIONAL COOPERATION IN HYDROLOGY (MEZHDUNARODNOYE SOTRUDNICHESTVO V OBLASTI GIDROLOGII),
Hydrometeorological Service of the USSR, (Moscow).
For primary bibliographic entry see Field 06E.
W73-14855

A STUDY OF TOXICITY AND BIOSTIMULATION IN SAN FRANCISCO BAY-DELTA WASTERS, VOLUME II, A STATISTICAL EVALUATION OF THE RELATIONSHIP BETWEEN TOXICITY AND SPECIES DIVERSITY INDEX.
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 05C.
W73-14877

PLANNING THE DEVELOPMENT OF THE NESTOS RIVER,
COBA-Consulpresa, Lisbon (Portugal).
For primary bibliographic entry see Field 04A.
W73-14907

ENVIRONMENTAL MONITORING HELPS RESOLVE POLLUTION PROBLEMS,
Westinghouse Electric Corp., Raleigh, N.C. Meter Div.
For primary bibliographic entry see Field 05A.
W73-14917

FLOOD-VOLUME DESIGN DATA FOR MISSOURI STREAMS,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 02E.
W73-14990

PATTERNS OF VARIABILITY OF RIVER RUNOFF AS A BASIS FOR A THEORY OF ITS REGULATION AND USE (ZAKONOMERNOSTI KOLEBANIY RECHNOGO STOKA KAK

OSNOVA TEORII YEGO REGULIROVANIYA I ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 04A.
W73-15010

A PROPOSAL FOR ESTIMATING TROPICAL STORM PROBABLE MAXIMUM PRECIPITATION (PMP) FOR SPARSE-DATA REGIONS,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 02B.
W73-15035

REMOVAL OF UNIT HYDROGRAPH OSCILLATIONS BY FILTERING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15040

FLOOD EVALUATION BY SOME DATA GENERATION TECHNIQUES,
Birmingham Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15041

LONG TERM RUNOFF ANALYSIS BY A CONCEPTUAL PHYSICAL MODEL,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 02A.
W73-15042

FLOOD CONTROL PLANNING WITH INADEQUATE HYDROLOGIC DATA,
Malyiya Regional Engineering Coll., Jaipur (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-15048

LOG-PEARSON TYPE III AND GUMBEL ANALYSES OF FLOODS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15049

BEST FITTING OF PROBABILITY FUNCTIONS TO A SET OF DATA FOR FLOOD STUDIES,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 02E.
W73-15050

RELIABILITY OF ESTIMATES OF THE EXCEEDENCE PROBABILITY OF A GIVEN FLOOD MAGNITUDE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15051

A NEW PROPOSAL FOR COMPUTATION OF FLOOD FREQUENCY,
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
For primary bibliographic entry see Field 02E.
W73-15052

RISKS FROM USING INADEQUATE FLOOD RECORDS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 02E.
W73-15053

STOCHASTIC MODEL OF FLOOD RISK EVALUATION,
West Virginia Inst. of Tech., Montgomery. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-15054

A MODIFIED MONTE CARLO TECHNIQUE TO SOLVE GROUNDWATER MOVEMENT AS AFFECTED BY FLOOD STAGES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 02F.
W73-15055

OBJECTIVE REGIONALIZATION OF PEAK FLOW RATES,
Agricultural Research Service, Chickasha, Okla. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02E.
W73-15057

SOME METHODS FOR ESTIMATION OF FLOODS IN A TROPICAL AREA,
World Meteorological Organization, San Jose (Costa Rica). Central American Hydrometeorological Project.
For primary bibliographic entry see Field 02E.
W73-15058

FLOOD CHARACTERISTICS OF THE RAMU RIVER, NEW GUINEA,
Papua and New Guinea Inst. of Tech., Lae (New Guinea). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-15063

SOME MEASURES OF AGRICULTURAL DROUGHT,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 03F.
W73-15064

A METHODOLOGY FOR ANALYSING AGRICULTURAL DROUGHT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03F.
W73-15066

USE OF REGIONAL ECONOMIC MODELS IN THE EVALUATION OF DROUGHT IMPACT,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 06B.
W73-15068

A NOTE ON THE GENERATION OF GAMMA RANDOM VARIABLES WITH NON-INTEGRAL SHAPE PARAMETER,
Birmingham Univ. (England).
J. Whittaker.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 591-594, 1973. 5 ref.

Descriptors: *Statistics, *Variability, *Simulation analysis, *Synthetic hydrology, Probability, Stochastic processes, Statistical models.
Identifiers: *Gamma distributions.

A method is given for generating a variable, using random numbers, to obtain the gamma distribution (Pearson Type III) with nonintegral shape parameter. Ordinarily this method requires the generation of less than four uniform random variables. (Knapp-USGS)
W73-15071

STATISTICAL PROPERTIES OF RUNS AS APPLIED TO HYDROLOGIC DROUGHTS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02E.
W73-15075

THEORETICAL STUDIES ON GAMMA-TYPE DISTRIBUTION AND RUNS--THEIR APPLICATIONS TO HYDROLOGY,
Osaka Univ. (Japan). Dept. of Civil Engineering.
A. Murota, and T. Eto.
In: Floods and Droughts; Proceedings of 2nd International Symposium in Hydrology, September 11-13, 1972, Fort Collins, Colorado: Water Resources Publications, Fort Collins, p 648-664, 1973. 12 fig, 1 tab, 1 ref.

Descriptors: *Hydrologic data, *Statistics, *Probability, Statistical methods, *Distribution patterns, Variability, Data collections, Frequency analysis, Depth-area-duration analysis, Time series analysis.
Identifiers: Gamma distributions.

Hydrologic variates frequently show skew distributions, such as Gamma-type distributions. Some theories on Gamma-type distribution and runs are reviewed. The approximate distribution function of the sum of multivariates can be applied to the sequences of correlated variates and even to the case with a discontinuity (no precipitation in precipitation time sequences). The solutions are illustrated in an analysis of the relation between time unit and the probability density function of observed hydrologic data; the solutions are shown to have sufficient accuracy in practice. (Knapp-USGS)
W73-15077

NEBRASKA IS NO. ONE.
For primary bibliographic entry see Field 05B.
W73-15171

AN APPRAISAL OF THE COMPUTATION OF STATISTICAL PARAMETERS IN GRAIN SIZE ANALYSIS,
Unit of Coastal Sedimentation, Taunton (England).
For primary bibliographic entry see Field 02J.
W73-15264

HYDROLOGIC DATA FOR 1971, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-15266

08. ENGINEERING WORKS

8A. Structures

PROBLEMS OF RESERVOIR CONSTRUCTION AND COMPLEX USE IN THE USSR (PROBLEMY SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA VODOKHRANILISHCH V SSSR),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. B. Avakyan.
Vodnyye Resursy, No 1, p 119-137, 1972. 5 fig, 19 ref.

Descriptors: *Reservoirs, *Reservoir construction, *Reservoir design, *Reservoir operation, *Water utilization, Competing uses, Environment, Land resources, Land use, Economics, Agriculture, Maps.
Identifiers: *USSR.

The problem of construction and complex use of reservoirs in the USSR is examined as part of the problem of the interplay of society and environ-

ment. Positive and negative aspects of reservoir construction are analyzed in discussing the importance of reservoirs to the national economy, the purpose of purposes of reservoirs, and the physical and economic factors that affect reservoir design and operation. (Josefson-USGS)
W73-14851

LOUISIANA SUPERPORT STUDIES: REPORT 1, PRELIMINARY RECOMMENDATIONS AND DATA ANALYSIS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 06B.
W73-15018

SUMMARY OF A REPORT TO THE SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT ON THE BAYLANDS SALT WATER FLOOD CONTROL PLANNING STUDY.
Santa Clara County Flood Control and Water District, San Jose, Calif.
For primary bibliographic entry see Field 04A.
W73-15020

THE BATH STORY - NEW KENNEBEC RIVER SUBAQUEOUS WATER MAIN,
Fay, Spofford, and Thorndike, Inc., Boston, Mass.
C. S. Mansfield.
Journal of the New England Water Works Association, Vol 87, No 1, p 8-18, March, 1973. 2 photos.

Descriptors: *Closed conduits, *Maine, River regulation, Rivers, River flow, Water supply, Costs.
Identifiers: *Subaqueous conduits, *Water system expansion, Subaqueous pipe laying, Bath (Maine), *Kennebec River (Maine).

Two engineering phases led to the installation of a subaqueous water main crossing of the Kennebec River at Bath, Maine. The first phase consisted of preliminary design under which construction requirements and pipe routes were established. The pile bents of the original main were first examined to see if there was enough space available on the bents for the installation of a second main. Although the availability of space was established, possible danger to the original main during the installation of the new one necessitated choosing an alternative location. Cost considerations determined the final selection of a downstream route using ductile iron river pipe to be installed on the river bottom. The second phase involved the final design, permits, licenses, and approvals. To pinpoint the best route, a 100 foot wide band across the river was investigated, and a natural scale profile developed along a straight line at the apparent best location. This information was incorporated into a licensed plan that was filed with the Maine Environmental Improvement Commision and the Department of the Army, Corps of Engineers. Approval was obtained, the Trustees authorized purchase of pipe line and the contract was awarded. Construction proceeded rapidly, with the finished unit cost of the watermain $74 per foot. (Hoffman-North Carolina)
W73-15025

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX 1, CORRESPONDENCE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W73-15137

ENVIRONMENTAL DEFENSE FUND, INC. V. ARMSTRONG (ACTION BY ENVIRONMENTAL PROTECTION GROUPS AGAINST COMMISSIONER OF BUREAU OF RECLAMATION AND OTHERS FOR INJUNCTIVE RELIEF WITH RESPECT TO THE PROPOSED NEW MELONES DAM).
For primary bibliographic entry see Field 06E.
W73-15146

DEEP WATER PORT POLICY ISSUES.
For primary bibliographic entry see Field 06E.
W73-15163

CONSTRUCTION OF MOORING FACILITIES, OHIO RIVER NAVIGATION SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Ohio River Div. Labs., Mariemont.

December 1972. 11 p, append.

Descriptors: *Ohio River, Fishing, Land use, Economics, Navigation.
Identifiers: *Mooring facilities, *Environmental Impact Statements.

The project concerns construction and maintenance of mooring facilities at various sites in the waters of the Ohio River and its navigable tributaries. The proposed action would have no known adverse economic or social impact but would reduce use of trees along the bank for mooring purposes with a consequent damage to or loss of such trees. The project would reduce erosion of the bank by allowing for instream mooring. The project would reduce, by a minor amount, the surface of the rivers currently available for fishing and some loss of river bed which now supports aquatic life. The alternative to this project is no action. Comments were received by interested officials and persons. (Wadley-Florida)
W73-15168

METROPOLITAN DISTRICT WATER SUPPLY SYSTEM, HARTFORD, CONNECTICUT: DESIGN FEATURES OF THE WATER TREATMENT PLANT AT RESERVOIR SIX,
Hartford Metropolitan District Water Bureau, Conn.
For primary bibliographic entry see Field 05F.
W73-15206

TARBELA DAM PROJECT, PAKISTAN,
Tippetts-Abbett-McCarthy-Stratton, New York.
W. V. Binger.
Journal of the Power Division, American Society of Civil Engineers, Vol 98, No PO2, p 221-245, October, 1972. 12 fig, 1 tab, 2 ref.

Descriptors: *Damsites, *Sediment control, *Water storage, *River basins, *Hydroelectric power, Dam construction, Dam design, Engineering geology, Irrigation water, Planning, Water utilization, River flow, Optimum development plans, Political aspects, Flood control.
Identifiers: *Pakistan (Tarbela Dam Project), *Indus River.

This dam complex, situated on the Indus River, will provide irrigation storage and hydroelectric power as well as measure of flood control when completed. The annual sediment load of the Indus River is 440,000,000 tons, which gives ample evidence of its erosional power. Principal sources of water for this basin come from snow melt from the Himalayas, and monsoons with seasonal peak flow in midsummer. Constructional considerations, because of the river's steep gradient--8 ft. per mile, with high flow velocities--and geographical and political situations made selection of the site difficult. Also described are three aspects of the project's construction: (1) river management, involving the use of substantial temporary-works buttress dam; (2) embankment fill, most of which is transported by conveyor belt; and (3) contractual arrangements, whereby resources are mobilized on a global scale. When completed, this hydroelectric power project will be the largest in Pakistan with the main embankment dam being the largest in the world. (Bahre-Ariz.)
W73-15211

8B. Hydraulics

GEOHYDROLOGY OF THE CROSS-FLORIDA BARGE CANAL AREA WITH SPECIAL REFERENCE TO THE OCALA VICINITY,
Geological Survey, Tallahassee, Fla.
G. E. Faulkner.
Water Resources Investigations 1-73, March 1973. 117 p, 35 fig, 3 tab, 66 ref.

Descriptors: *Hydrogeology, *Canal construction, *Inland waterways, *Florida, Water quality, Environmental effects, Aquifers, Water chemistry, Mixing, Atlantic Ocean, Gulf of Mexico, Groundwater, Surface waters, Groundwater movement, Groundwater recharge, Discharge (Water), Engineering structures.
Identifiers: *Cross-state canal (Fla), Barge Canal.

The Cross-Florida Barge Canal will extend from Palatka on the St. Johns River southwestward 110 miles to the Gulf of Mexico near Yankeetown. It will be 150 feet wide, have a minimum water depth of 12 feet, and have five locks. From near Ocala northeastward, the canal channel will be in sandy and clayey sediments overlying and confining the Floridan Aquifer, which consists of cavernous limestone. Here, exchange of water between the canal and the Floridan Aquifer will be small. Westward from Ocala, the Floridan Aquifer is unconfined and the canal will be excavated into cavernous limestone below the water table. Here, exchange of water will be direct between the canal and the aquifer. In most places flow will be from the aquifer to the canal, but in the 28-mile summit reach, the canal will simultaneously gain and lose water most of the time. Two zones of outflow from the canal to the aquifer are probable in the summit reach. Of principal importance is a 4-mile reach of the canal from which water will enter the aquifer and move toward Silver Springs 5 miles to the north. (Woodard-USGS)
W73-14807

SALT-WATER MOVEMENT IN THE LOWER WITHLACOOCHEE RIVER--CROSS-FLORIDA BARGE CANAL COMPLEX,
Geological Survey, Tallahassee, Fla.
P. W. Bush.

Descriptors: *Saline water intrusion, *Estuaries, *Canals, *Florida, Environmental effects, Canal construction, Streamflow, Flow rates, Discharge (Water), Tidal effects, Gulf of Mexico.
Identifiers: *Withlacoochee River (Fla), *Cross-Barge Canal (Fla).

Construction of the west end of the Cross-Florida Barge Canal changed the regimen of the lower Withlacoochee River. An investigation was made to determine how saltwater from the Gulf of Mexico moves in the river-canal complex, and how the factors that control saltwater movement--tides and discharges--have changed since canal construction. In the river below the bypass channel, saltwater moves inland as a wedge beneath the freshwater with upstream tidal flows and back toward the Gulf with downstream tidal flows. Freshwater discharge during the investigation ranged from 500 to 1,500 cfs. The only time that freshwater discharge clearly showed an effect on upstream saltwater movement was the 4-day period when discharge was reduced to about 500 cfs. Tides seem to have a stronger influence on upstream movement of the salt front than discharge in the 500- to 1,500-cfs range. For instance, the estimated farthest upstream movement of the salt front dur-

ing the investigation occurred when discharge was 1,320 cfs. The point of maximum intrusion on this occasion was about 4.8 miles upstream from the river entrance. The event must be uncommon, as saltwater was present on the bottom at the station 3.3 miles from the river entrance only 1.7% of the total time during the year of record. (See also W73-14809) (Woodard-USGS)
W73-14808

GROUND-WATER CONDITIONS IN THE LOWER WITHLACOOCHEE RIVER--CROSS-FLORIDA BARGE CANAL COMPLES AREA,
Geological Survey, Tallahassee, Fla.
G. L. Faulkner.
Water Resources Investigations 4-72, January 1973. 31 p, 11 fig, 2 tab, 8 ref.

Descriptors: *Hydrology, *Canal construction, *Inland waterways, *Florida, *Water quality, Environmental effects, Aquifers, Groundwater movement, Water chemistry, Saline water intrusion, Drainage effects, Water wells, Water level fluctuations, Surface waters, Groundwater recharge.
Identifiers: *Cross-Florida Barge Canal, *Withlacoochee River.

Construction of the westernmost 7-mile reach of the Cross-Florida Barge Canal, which intersects the lower Withlacoochee River 9 miles above its mouth, was begun in 1965 and was completed in 1969. The river channel and the canal penetrate the cavernous limestone of the Floridan Aquifer below the water table. Groundwater levels in a 15-square mile area centered at the canal about 4.5 miles from the Gulf of Mexico are 0.5 foot to 15 feet lower than if the canal had not been built. In another 0.7-square mile area surrounding the Inglis Lock bypass channel the groundwater level has been raised 0.5 foot to 20 feet above the pre-canal level. The average groundwater contribution to the flow of the lower river is 20% less (7 cfs) than before the canal was built. This is about 0.5% of the average freshwater flow that would have passed down the river from October 1, 1970, through September 30, 1971, if the canal had not been built. The freshwater-saltwater zone of diffusion in the aquifer tends to rise in the area where the groundwater levels have been lowered. (See also W73-14808) (Woodard-USGS)
W73-14809

MIXING PROCESSES IN WIDE OPEN CHENNELS,
State Inst. of Hydrology and Meteorology, Warsaw (Poland).
For primary bibliographic entry see Field 05B.
W73-14828

FLOOD CONTROL IN RESERVOIRS AND STORAGE POUNDS,
Sheffield Univ. (England).
For primary bibliographic entry see Field 04A.
W73-14832

THEORIES AND RELATIONSHIPS OF RIVER CHANNEL PATTERNS,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 02E.
W73-14833

BOTTOM WITHDRAWAL OF VISCOUS STRATIFIED FLUID,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 04A.
W73-14837

PLANE JET ON SLOPING FLOORS UNDER FINITE SUBMERGENCE,
Department of the Environment, (Alberta). Water Resources Div.
V. Mura Hari.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 10027, p 1449-1460, September 1973. 8 fig, 1 tab, 5 ref, append.

Descriptors: *Jets, *Boundary layers, *Hydraulic jump, Turbulent flow, Equations, Hydrodynamics, Slopes.
Identifiers: Submerged flow, Sloping floors.

The mean flow characteristics of two-dimensional turbulent jets diffusing on sloping floors under submergence were examined. The turbulent wall-jet model was used to derive simple power-law type mathematical expressions for the decay of jet velocity, growth of the jet and the bed shear stress distribution. These mathematical predictions were compared with experimental observations. Observations were also made on the velocity distribution in the boundary layer and presented graphically. (Knapp-USGS)
W73-14840

TURBULENT ENTRAINMENT IN BUOYANT JETS AND PLUMES,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B.
W73-14841

MINIMUM LENGTH OF SALT INTRUSION IN ESTUARIES,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-14842

SEEPAGE INTO SHEET PILE COFFERDAM,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
B. S. Rama Rao, and J. Visweswara Rao.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, Paper 10001, p 1515-1530, September 1973. 4 fig, 1 tab, 20 ref, append.

Descriptors: *Seepage, *Laplaces equation, *Cofferdams, *Sheet piling, Groundwater movement, Mathematical studies, Dimensional analysis.

Steady saturated seepage through a homogeneous porous medium is governed by Laplace's equation. The real and imaginary parts of an analytic function of a complex variable, being the solutions of Laplace's equation, represent the potential and stream functions of two-dimensional seepage problems. The Weierstrass zeta function transforms conformally a rectangle into the geometry of a sheet pile cofferdam and yields the potential and stream functions in the flow field. The Weierstrass P-function gives the velocity distribution. By a simple modification of the zeta function, a general transformation function maps the same rectangle into cofferdams with widely different shape parameters having identical seepage flux parameter. The relationship between two zeta functions whose period ratios are reciprocal to each other are deduced. The computation for drawing the flow nets of two different groups of cofferdams with the seepage flux parameter of one group being the reciprocal of the other are practically the same. Application of this result decreases the computational effort immensely. (Knapp-USGS)
W73-14843

SEDIMENTATION IN MANGLA RESERVOIR,
Harza Engineering Co., Chicago, Ill. Industrial Basin Div.
For primary bibliographic entry see Field 02J
W73-14845

BASIC PATTERNS IN MOVEMENT OF FLUVIAL SEDIMENTS (OSNOVNYYE ZAKONOMERNOSTI DVIZHENIYA RECHNYKH NANOSOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 02J.
W73-14850

IRRIGATION CANAL SYSTEM CAPACITY DESIGN CRITERIA,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 03F.
W73-14906

LEAST-COST DESIGN OF WATER DISTRIBUTION SYSTEMS,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-14911

WATERSHED FLOOD ROUTING USING DISTRIBUTED PARAMETERS,
Agricultural Research Service, Brookings, S. Dak.
For primary bibliographic entry see Field 02E.
W73-15059

SIMULATION MODEL FOR THE DECISION BETWEEN DILUTION OR SEWAGE TREATMENT DURING DROUGHTS,
Universidade Federal Sao Carlos, Sao Paulo (Brazil). Dept. of Hydraulics.
For primary bibliographic entry see Field 05G.
W73-15067

SIZING GRAVEL-PACK-LINER SLOTS IN OIL AND GAS WELLS,
For primary bibliographic entry see Field 08G.
W73-15192

A RAPID METHOD OF PREDICTING WIDTH AND EXTENT OF HYDRAULICALLY INDUCED FRACTURES,
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 08G.
W73-15194

WETTABILITY AS RELATED TO CAPILLARY ACTION IN POROUS MEDIA,
Socony Mobil Oil Co., Inc., Dallas, Tex.
For primary bibliographic entry see Field 08D.
W73-15195

8C. Hydraulic Machinery

ENERGY AND FLOW REQUIREMENTS FOR CHOPPING WATER HYACINTHS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-14759

AUTOMATED IRRIGATION IS HERE,
Washington State Univ., Prosser. Cooperative Extension Service.
For primary bibliographic entry see Field 03F.
W73-15212

D. Soil Mechanics

EEPAGE INTO SHEET PILE COFFERDAM,
dian Inst. of Tech., Kharagpur. Dept. of Civil ngineering.
or primary bibliographic entry see Field 08B.
73-14843

AYS CREEK LAKE PROJECT, SOUTH MPQUA RIVER, DOUGLAS COUNTY, REGON, (FINAL ENVIRONMENTAL STATE-ENT).
ffice of the Chief of Engineers (Army), Washing-n, D.C.
or primary bibliographic entry see Field 04A.
73-15017

IRIE DAM AND LAKE, WILLOW CREEK, DAHO (FINAL ENVIRONMENTAL IMPACT TATEMENT).
rmy Engineer District, Walla Walla, Wash.
or primary bibliographic entry see Field 04A.
73-15162

VETTABILITY AS RELATED TO CAPILLARY CTION IN POROUS MEDIA,
ocony Mobil Oil Co., Inc., Dallas, Tex.
. C. Melrose.
ociety of Petroleum Engineers Journal, Vol 5, No , p 259-271, September 1965. 7 fig, 1 tab, 42 ref.

Descriptors: *Capillary action, *Surface tension, Porous media, *Wettability, Wetting, Hysterisis, Drainage, Surfaces, Pores, Unconsolidated sediments, Earth-water interfaces.
Identifiers: *Ideal soil model, Capillary tube, Contact angle, *Imbibition, *Interfacial tension, Pendular ring interface, Particle packing.

A mathematical analysis was made of the role of wettability in capillary action in porous media. A comparison of the applicability of cylindrical capillary tube concept with that of the 'ideal soil model' showed that the capillary tube model was not applicable to situations which involve varying wettability. The ideal soil model considers the porous medium as composed of spherical particles of uniform size, with packing of the spheres either simple cubic or rhombohedral. The ideal soil model predicts that the pore structure of typical porous solids will lead to hysteresis effects in capillary pressure, even if a zero value of the contact angle is maintained. The model was generalized to situations in which the contact angle takes on values between zero and 40 degrees. For the imbibition branch of the capillary-pressure function, the model predicts a considerable departure from the usually assumed cos theta relationship. It is possible, according to the model, that a displaced wetting phase will not be able to reimbibe, even when the contact angle does not exhibit hysteresis. (Gray-NWWA)
W73-15195

TARBELA DAM PROJECT, PAKISTAN,
Tippetts-Abbett-McCarthy-Stratton, New York.
For primary bibliographic entry see Field 08A.
W73-15211

8G. Materials

ANALYSIS OF HIGH-PURITY WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. I. THE USE OF AN AUTOMATED SAMPLING SYSTEM,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 05A.
W73-14955

ANALYSIS OF HIGH-PURITY WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. II. SIGNAL INTEGRATION WITH A NON-RESONANCE LINE CORRECTION SYSTEM FOR SPURIOUS ABSORPTION PHENOMENA,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 05A.
W73-14956

SIZING GRAVEL-PACK-LINER SLOTS IN OIL AND GAS WELLS,
E. B. Rogers, Jr.
Oil and Gas Journal, Vol 69, No 5, p 58-60, November 8, 1971. 3 fig.

Descriptors: Oil industry, *Wells, *Wells screens, Size, *Oil wells.
Identifiers: Mud packs, *Gravel sizing, *Gravel pack implacement, Well completion practices.

The choosing and implacement of a gravel pack and liner are discussed. The sizing of slots for a gravel pack liner is based on a slightly different philosophy than the sizing of screen slots. In the latter case there is essentially unlimited supply of formation material to furnish larger grains to bridge the slots. In the case of gravel packs, there is only a finite amount of gravel outside the liner. If more than a small amount of the pack material passes before a bridge is formed, the pack has in effect disappeared. Therefore, gravel-pack-liner slots are more conservatively designed. Three formulas for sizing criteria are presented. The common types of packs are illustrated and methods of implacement are discussed. Improper completion practices or placement techniques may result in poor efficiency even though proper sizing was achieved. Primary factors for successful completion are presented. (Hunt-NWWA)
W73-15192

A RAPID METHOD OF PREDICTING WIDTH AND EXTENT OF HYDRAULICALLY INDUCED FRACTURES,
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
J. Geertsma, and F. deKlerk.
Journal of Petroleum Technology, Vol 21, No 12, p 1571-1581, December 1969. 10 fig, 1 tab, 12 ref.

Descriptors: *Fracture permeability, *Fractures (Geologic), Permeability, Flow, Poisson ratio, Tensile stress, Tensile strength, Pressure, Reynolds number.
Identifiers: *Hydraulic fractures, *Fracture design charts, *Fracture dimensions, Linear fracture, Radial fracture, Propping agent, Spurt loss.

In the process of hydraulic fracturing, the liquid pressure in the borehole is increased until tensile stress in the surrounding rock exceeds tensile strength. The tensile fracture then is penetrated by liquid from the borehole and fracture propogation under continuous hydraulic action occurs. The fracturing liquid may carry a propping agent. Prediction of fracture width and areal extent before release of pressure is dependent on the applicability of a number of simplifying assumptions. If these assumptions are granted, the fracture extension process can be formulated mathematically and equations derived for fracture width and shape, and the effect of formation permeability on fracture dimensions. Fracture design charts were devised and their application to field operations is illustrated. (Gray-NWWA)
W73-15194

8I. Fisheries Engineering

THE EFFECT OF THERMAL INPUTS ON THE POPULATIONS OF FISH AND MACROINVERTEBRATES IN THE WABASH RIVER,
DePauw Univ., Greencastle, Ind.
For primary bibliographic entry see Field 05C.
W73-14869

AN APPLICATION OF LOUVER DEFLECTORS FOR GUIDING ATLANTIC SALMON (SALMO SALAR) SMOLTS FROM POWER TURBINES,
Department of the Environment, Halifax (Nova Scotia). Fisheries Service.
L. J. A. Ducharme.
J Fish Res Board Can. Vol 29, No 10, p 1397-1404. 1972. Illus.
Identifiers: *Atlantic salmon, *Canada (Nova Scotia), Louver deflectors, Power turbines, Salmo-Salar, Salmon, Smolts, *Fish guiding.

Louver deflectors for guiding S. salar away from destructive power turbines were installed in a canal leading to the powerhouse at East River, Sheet Harbour, Nova Scotia (Canada), in 1966. Guiding efficiency studies, using hatchery-reared smolts, showed that a minimum approach:bypass velocity ratio of 1.0:1.5 was prerequisite to high guiding efficiency. From 1967 to 1971, average guiding efficiency was increased from 57% to 80% through modifications which increased velocity and reduced flow turbulence in the bypass. A significant correlation existed between approach velocity and guiding efficiency with the range tested after bypass hydraulics had been modified. Tests conducted with varying louver bar spacing ranging from 5.1-30.5 cm (2-12 in.) showed that the wider spacings did not impair guiding efficiency. Vertical distribution of smolt migrants in the power canal indicated that over 80% of the fish remained above depth 1.3 m. This was borne out by the fact that the bypass was effective when operating to a depth of only 0.91 m. An appraisal of the practicality of the louver guiding system is presented.--Copyright 1973, Biological Abstracts, Inc.
W73-14927

THE BEHAVIOR OF ADULT AMERICAN SHAD (ALOSA SAPIDISSIMA) DURING MIGRATION FROM SALT TO FRESH WATER AS OBSERVED BY ULTRASONIC TRACKING TECHNIQUES,
McGill Univ., Montreal (Quebec). Dept. of Biology.
J. J. Dodson, W. C. Leggett, and R. A. Jones.
J Fish Res Board Can. Vol 29, No 10, p 1445-1449, 1972. Illus.
Identifiers: Alosa-sapidissima, Physiological adaptation, *Shad, *Ultrasonic tracking, Fish migration, Fish behavior.

Five of 7 adult A. sapidissma, tracked continuously with ultrasonic transmitters in the lower estuary of the Connecticut River in 1968 during their spawning migration of fresh water, exhibited extensive meandering, ranging 24-53 hr in duration in the region of the saltwater-freshwater interface. The salinity in the Connecticut River is like a wedge; its daily position is dependent on upland discharge, and its hourly position is dependent on tidal activity. The fish were observed during all tidal conditions and at several discharge rates, and in all cases they remained near the leading edge of salt water during the meandering phase. This behavior pattern was not a result of handling nor was it a typical behavioral response to tidal cycle. The meandering observed in the region of the saltwater-freshwater interface was due to physiological adaptation of the fish to fresh water. Of the remaining 2 shad tagged, 1 proceeded directly upstream without meandering, and 1 moved downstream.--Copyright 1973, Biological Abstracts, Inc.
W73-14953

BEHAVIOR OF TRITIUM IN FISH FOLLOWING CHRONIC EXPOSURE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 05C.
W73-14964

ABSENCE OF ACUTE EFFECTS ON THREESPINE STICKLEBACKS (GASTEROSTEUS ACULEATUS) AND COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO RESUSPENDED HARBOR SEDIMENT CONTAMINANTS,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 05C.
W73-15095

YOLK-SAC MALFORMATION IN PACIFIC SALMON IN RELATION TO SUBSTRATE, TEMPERATURE, AND WATER VELOCITY,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W73-15102

A MIDWATER TRAWL FOR THREADFIN SHAD, DOROSOMA PETENENSE,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 02H.
W73-15288

CORRELATIONS BETWEEN ALEWIFE ACTIVITY AND ENVIRONMENTAL VARIABLES AT A FISHWAY,
Rhode Island Univ., Kingston. Marine Experiment Station.
S. B. Saila, T. T. Polgar, D. J. Sheehy, and J. M. Flowers.
Trans Am Fish Soc. Vol 101, No 4, p 583-594. 1972. Illus.
Identifiers: *Alewife, Alosa-Pseudoharengus, Environmental variables, *Fishway, *Rhode Island (Annaquatucket River), Fish counting, Monitoring.

An automatic recording system for fish counting and for the monitoring of water temperature, dissolved O2 pH and solar radiation was employed on a newly constructed fishway on the Annaquatucket River, North Kingstown, Rhode Island. Records of fishway utilization by the alewife, Alosa pseudoharengus and of the environmental variables were critically examined by time series autocorrelation and crosscorrelation techniques. It was demonstrated that migratory activity was hormonic with a diurnal periodicity and was closely associated with incident solar radiation. Suggestions for an improved monitoring system and further analysis were made.–Copyright 1973, Biological Abstracts, Inc.
W73-15297

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT OF ACTIVITIES DURING FISCAL YEAR 1973.
Maine Univ., Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 09D.
W73-14752

APPLIED WATER CHEMISTRY AT WASHINGTON STATE UNIVERSITY,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
E. Hindin.
In: Preprints of Papers Presented at 166th National Meeting of American Chemical Society, August 1973, Chicago, Ill: American Chemical Society, Division of Environmental Chemistry, Vol 13, No 2, Paper 27, p 92-94, 1973. EPA Grant WP-170-05 (T900-208).

Descriptors: *Education, *Universities, *Grants, Water chemistry, Environment, Ecology, Water pollution control, *Washington.
Identifiers: Washington State University.

Through support from the professional training grants program of the Office of Water Programs of the Environmental Protection Agency, a plan of studies in applied water chemistry was initiated at Washington State University during the 1971-72 academic year. The aim of the plan of studies is to train persons to meet the needs of federal, state, local and industrial entities where the monitoring, analysis and data evaluation of the various segments of the aquatic environment are performed. The plan of studies is multidisciplinary in nature due to the existence of common principles and extensive interrelationships among various disciplines within the Departments of Chemistry, Civil Engineering and Soils. The plan of studies, administered by the Applied Water Chemistry subcommittee of the Environmental Science Program, leads to a Masters of Science degree in Environmental Science. The plan is directed primarily to holders of undergraduate degrees in Chemistry, Chemical Engineering or in any of the physical, biological or environmental sciences with a strong background in chemistry. (Knapp-USGS)
W73-14787

NINTH ANNUAL REPORT WATER RESOURCES RESEARCH CENTER.
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 09D.
W73-14872

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT OF ACTIVITIES DURING FISCAL YEAR 1973.
Maine Univ., Orono. Land and Water Resources Inst.

Available from the National Technical Information Service as PB-223 869, $3.00 in paper copy, $1.45 in microfiche. Annual Report No 9, July 1973. 25 p. OWRR A-999-ME (10).

Descriptors: *Water resources development, *Maine, Bibliographies, *Projects, Abstracts, Universities, State governments, Surface waters, Water pollution sources, Water pollution effects, Lakes, Streams, Aquatic life, Ecosystems, Environmental effects, Biology, Water quality, Sediments, *Water Resource Institute.
Identifiers: *Annual projects report.

From its inception in 1965 the Land and Water Resources Institute of the University of Maine consistently has followed a policy of working with local, state and regional water users and officials to define and resolve water resources problems. Projects in progress by the Institute during the 1973 FY include: a predictive model for sludge characterization useful to design and control of sludge dewatering processes in water recycle systems; phosphate retention by lake sediments; the effects of burrowing tubificid worms on the exchange of phosphorus between lake sediments and overlying water; a study of the physico-chemical parameters affecting the removal of colloidal particles by porous media; dissolved pollution product gases in natural waters; political and environmental attitudes or voters and public officials related to alternative levels of water quality and correlated alternative systems of management of the Penobscot River; the historic and present relationships between phytoplankton, limiting nutrients, and sediment-water geochemical processes in selected Maine lakes; the effects of PCB's and selected herbicides on the biology and growth of Platymonas Subcordiformis and other algae; the macroinvertebrate fauna of a Maine salmon river subjected to long-term multiple pesticide contamination; septic tank effluent movement through soils, adsorption as a protective mechanism for water-borne viruses; and effect of development in the mountainous regions of Maine on water quality. (Woodard-USGS)
W73-14752

NINTH ANNUAL REPORT WATER RESOURCES RESEARCH CENTER.
Minnesota Univ., St. Paul. Water Resources Research Center.

Available from the National Technical Information Service as PB-224 058, $7.75 in paper copy, $1.45 in microfiche. Bulletin 61, August 1973. 107 p. OWRR A-999-MINN (29). 14-31-0001-3823.

Descriptors: *Research, *Water resources, *Minnesota, Education, *Projects, Expenditures, Manpower, Water management, Water pollution, Water resources reserach act, *Water Resource Institute.
Identifiers: Researchers, Applied Research, Basic research, Physical-Biological-Economic-Social Aspects, Faculty.

The Fiscal year 1973 budget of the Center was $413,724. The Center supported 18 research projects involving 19 faculty members. These research projects were concerned with: mathematical watershed system analysis, aquatic plants, eutrophic lakes, groundwater basin information, water resources research planning, soil water movement, Mississippi river ecology, perception of water resources problems, financing of water resources development, water pollution and social factors, forest management, water resources policies, sub-surface irrigation, flood forecasting, water policy decisions, precipitation variations, and floods. About 51 students received employment through the Center's program. During fiscal year 1973, there were 32 reports generated through research projects. (Walton-Minnesota)
W73-14872

IAEA RESEARCH CONTRACTS, THIRTEENTH ANNUAL REPORT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 05G.
W73-14960

10. SCIENTIFIC AND TECHNICAL INFORMATION

10F. Preparation of Reviews

THE ECOLOGY OF THE SOUTHERN CALIFORNIA BIGHT: IMPLICATIONS FOR WATER QUALITY MANAGEMENT.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 05C.
W73-14914

MAN AND THE ENVIRONMENT, A BIBLIOGRAPHY OF SELECTED PUBLICATIONS OF THE UNITED NATIONS SYSTEM, 1946-1971.
United Nations, New York.
For primary bibliographic entry see Field 05C.
W73-14974

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.

For primary bibliographic entry see Field 05C.
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TUBIFICIDS AND WATER QUALITY: A REVIEW,
Central Electricity Generating Board, Ratcliffe-on-Soar (England). Freshwater Biology Unit.
For primary bibliographic entry see Field 05C.
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TOXICOLOGY OF PESTICIDES: RECENT ADVANCES,
Mount Sinai School of Medicine, New York.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

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- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
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